MOTOR AGE

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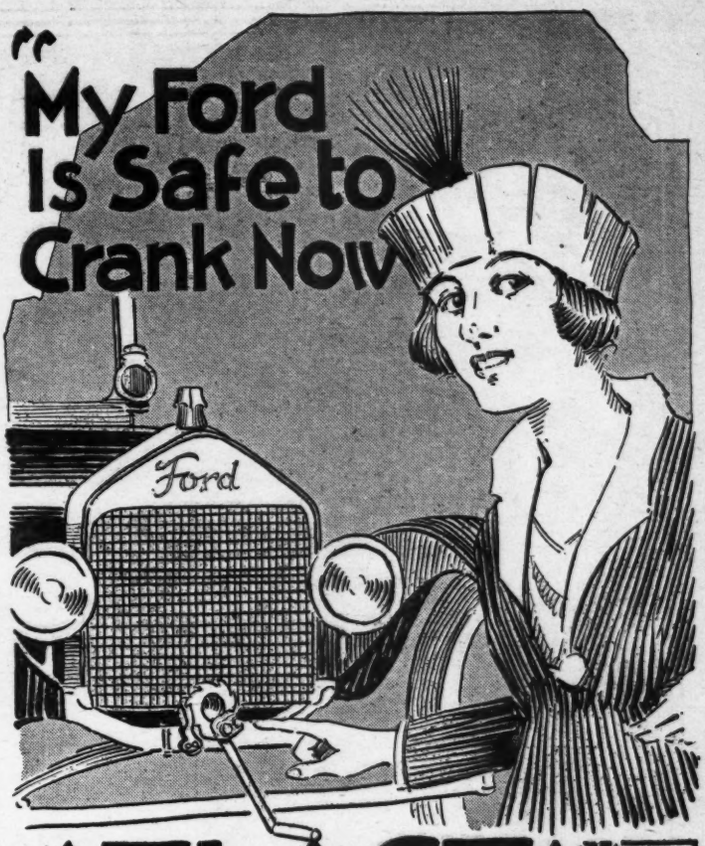

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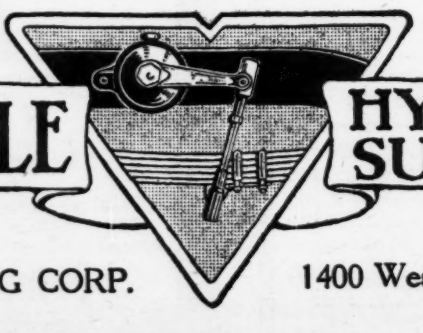
Certain desirable territory is still open for the right dealers



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MOTOR AGE

Through the Crystal Ball of Tractordom

Look Beyond Mr. Dealer

THE dealer who has taken on the tractor may liken his position unto that of the crystal gazer, when he looks into the future and sees the tractor a dominating factor in the automotive field.

But, let him turn the ball a little and focus his eyes more intently and see what lies beyond. Let him observe the possibilities which the tractor opens up. For, when the farmer buys a tractor he has but begun to buy. He has but scratched the surface of farm power equipment.

The culmination of the dealer's investment and efforts in the tractor world will depend to a great extent on the course he pursues in regards to tractor equipment. After all, the business end of the tractor is the implement drawn or the machine driven by the belt. The tractor is but a factor in motorization of the farm. Alone it has no value. It is only in combination with other machinery where the tractor shows its real usefulness.

Then there is the motor cultivator, looked upon as a necessity on the motorized farm. The tractor is far too powerful for many jobs, so that it would be poor economy to attempt its use. Furthermore, for cultivation of corn and similar work the tractor will not do, except for one or two machines that have been brought out as all-purpose outfits. The motor cultivator is going to cause a tremendous influence in power farming circles in the next few years.

Complete displacement of the horse on the farm is going to be brought about also by the motor truck. What size truck is going to dominate is hard to say, but present indications are that a truck capable of carrying 60 bushels of wheat will be popular. Such a truck would be equal to about 1 1-2 ton capacity.

The farm power equipment dealer must be prepared to handle the isolated light plants. It is safe to say that the farmer who buys a tractor, motor cultivator, motor truck and other machines to help him in his work is not going to stand by and tolerate a kerosene lamp in his home. He is going to electrify home, barns and milk-house. So, when you look beyond the crystal ball, make sure that you see the farm light plant.

There are farms now completely motorized. We are just entering the great power farming era and the dealer who focuses his vision intently into the crystal ball and sees through it all the dawning of a new enterprise is going to be one of the biggest factors in the building up of his community.

Tractors Now Beyond Speculative Stage

Present Status of the Industry Seems to Indicate That There Will Be Three Types of Tractors for Some Time to Come—Parts Makers Affecting Destiny of Tractor Designs

By B. M. IKERT

The tractor industry is getting settled.

The tractor manufacturers having found out pretty well what ought to be made are working toward the betterment of their product.

Among the biggest thoughts coming out of the Fifth Annual National Tractor Show at Kansas City last week is the one that the industry has attained its full growth and bids fair to run parallel, before many years, with the motor car and motor truck industry.

By attaining its full growth we mean the tractor and its many allied industries are no longer looked upon as weaklings or visions of the future. Power farming is here to stay. True, many details still have to be dealt with. Many problems have to be decided in the next few years, but the men connected with the perpetuation of farm power equipment have the experience of the motor car and truck men to guide them.

Perfecting of Tractor Will Require Shorter Time

It, therefore, is logical to conclude that the perfecting of the tractor or farm power equipment will not require half the time it took to perfect other automotive apparatus. The problem resolves itself into one of adapting time-tried and accepted ideas to a new field.

There will be fewer freaks each year, as in the automobile period of development. We are past the experimental stage in bringing out tractors. It no longer is a question of three or four wheels, or whether the four-cylinder vertical type of automobile engine or the two-cylinder horizontal type of engine is going to dominate the field. There will be both types and present indications are they will go along side by side for some time to come.

The show this year brought home one idea that necessarily must be accepted by everyone connected in any way with the tractor industry and that is that we are going to have three types of machines probably for a good long time to come. These three are the unit type of tractor, the crawler and the tractor belonging to what might be called the old school of designers, wherein a two-cylinder horizontal engine and exposed gearing for final drive is used.

Unit Type of Machine Popular at Present

At present the unit type of machine, embodying a four-cylinder engine, with unit transmission and inclosed final drive dominates the field in the number of designs. The crawler type of tractor is gaining favor and this year there were more tractors of this design at Kansas City. The persistency of the old line makers serves to show that their products still are in demand, although it is probably quite certain that good selling organizations are doing much to keep these machines on the market year after year without material change in design. Probably another reason for the persistency of the horizontal-engine propelled tractor is that this type of engine seems to be handling kerosene quite satisfactorily.

One of the greatest strides made in the industry has been directed towards better bearing layouts. The motor car and truck industry have been helpful and the vast amount of data obtained after years of experiment is being adopted body and soul in the tractor. Plain bearings are the exception on present day tractors. We have seen in the last few years the transformation in bearing layouts on tractors from crude plain bearings to anti-friction bearings of both the roller and ball types.

This would have been brought about much earlier in the tractor industry had not the war come on. In war days it was difficult to get ball and roller bearings and the tractor makers had to be content with whatever the market afforded.

Makeshift steering arrangements are giving way to more advanced types of steering gears patterned after those used on trucks, using worm and gear, worm and traveling nut, etc., in connection with drag links. Chains and cables for steering are far in the minority on present-day two and three-plow machines, although they remain a necessity on the extremely large tractors capable of pulling twenty-four plows.

Parts Makers Influential in Tractor Design

The destiny of tractor design is being effected by the parts makers. To-day it is possible to build a tractor from units afforded by the market, just as it is possible to build passenger cars from standard units. We can assemble tractors from the units at hand, because the allied industries have given us engines, transmissions, axles, wheels, radiators, steering gears and so on down to the smallest units that go to make up the tractor.

That in itself is significant of the fact that the industry is getting settled. When the parts makers see fit to go to the expense of tooling up their factories for bringing out tractor parts, it stands to reason that much thought has gone into those parts and that the tractor makers as a whole know pretty well along what lines tractors ought to be built. In addition it makes possible quantity production and standardization of the product. The co-ordination of the efforts of the parts makers with the tractor manufacturers is doing much to help the tractor find its place in the automotive industry.

Steam Offers Possibilities in the Tractor Industry

The future holds many big things in store for the development of the tractor, especially in the engine. Thus we find the system of spraying fuel under pressure offering possibilities in the improvement of the four-stroke cycle engine, generally criticized for its low thermal efficiency.

There may be a revival of steam. Heavy fuels offer great possibilities for high pressure steam boilers, capable of delivering superheated steam at pressures from 800 to 1000 lbs. per sq. in. This with a four-cylinder vertical single-acting poppet valve type of engine of the uniflow principle might produce results in thermal efficiency that would rival the general performance of the average four-stroke cycle internal combustion engine. This would especially be true when burning the cheaper grades of oil.

The steam engine possesses certain qualities that make it well suited to vehicle propulsion, better, in fact, than the ordinary internal combustion engine. While one of our biggest problems today is with the proper burning of fuel in our engines, it is well to bear in mind the fact that fuels in the future will be heavier than those of today. The many difficulties incident to the proper vaporization of heavy fuels are better known than the means for doing it.

Along with the development of the tractor will come the perfecting of implements and machinery that must necessarily go with it. The tractor is useless if the implement it pulls is of inferior construction. Horse-drawn equipment long has passed that period where it was thought suitable for tractors. Belt-driven machinery, too, has come in for improvements. Where crude castings sufficed in the old days, we see the lighter forgings to-day and open forms of driving mechanisms are giving way to inclosed types. We are witnessing to-day a general polishing up throughout the realm of farm power equipment.

Impressions of the Kansas City Tractor Show

As Seen by Artist Wilder

A HIRED MAN WITH AT LEAST ONE LONG ARM IS A NECESSITY IF YOU BUY THIS TRACTOR

THE BUSH BROTHERS—HI. AND LOWELL KNOW MORE ABOUT TRACTORS THAN ABOUT BROADWAY STYLES.

A VISION TUNNEL OR A PERISCOPE WOULD AID MATERIALLY IN THE OPERATION OF SOME MACHINES

THIS BIRD DONT LOOK THE PART BUT HE RAISED 10,000 BU. OF WHEAT LAST YEAR AIDED BY THE TRACTOR AND IS NOW IN LOOKING FOR MORE POWER EQUIPMENT

THE HOUSE LIGHTING OUTFITS ATTRACTED MUCH ATTENTION

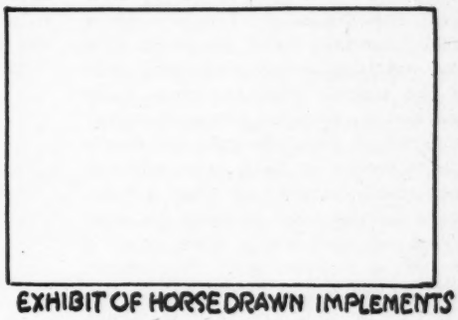
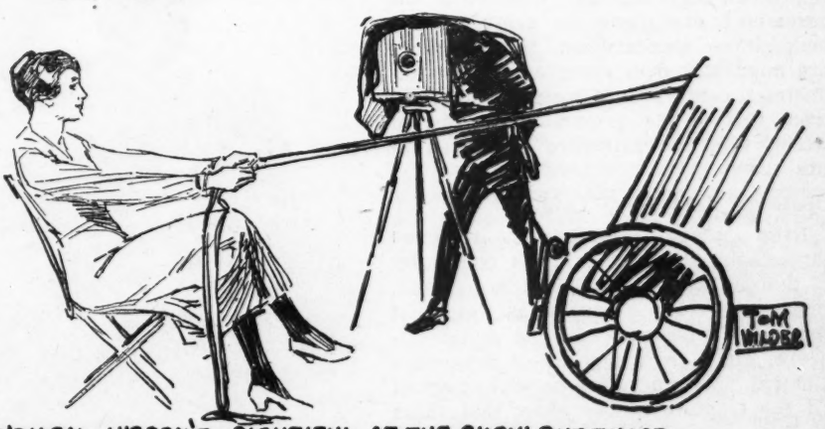


EXHIBIT OF HORSE DRAWN IMPLEMENTS

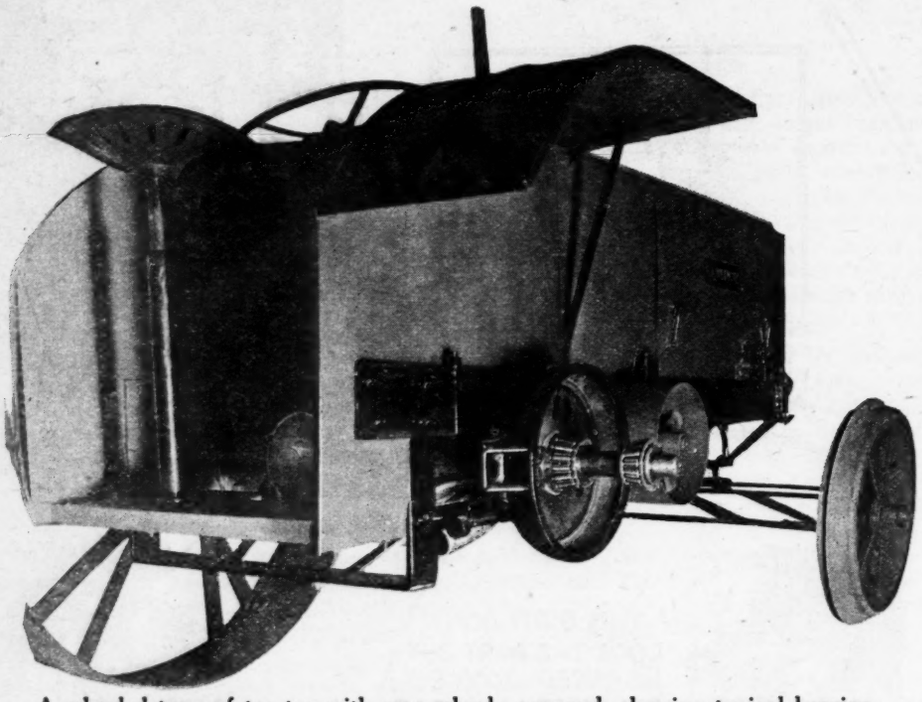


WOMEN WEREN'T PLENTIFUL AT THE SHOW BUT THOSE WHO WERE THERE WERE WELL DISPLAYED.

Good and Bad in Tractor Design

A Study of Exhibits at Kansas City Show—Standardization Is Progressing Rapidly

By ROY E. BERG
Technical Editor, Motor Age



A wheeled type of tractor with rear wheels removed, showing typical bearing layout and brake

ALL that was new in tractors, and all that was represented in new dress at the National Tractor Show in Kansas City last week, seems to give one, one indelible impression, and that is that the tractor manufacturers have now reached a common plane of elevation from which their designs are erected. There seems to have been effected a greater understanding of what a tractor should be and what it must do, over the period of last year, than over a similar period a year ago. The result is that standardization has gone so far, that the tractor industry is now where the motor car industry was when the assembled car made its debut. Parts makers of standardized tractor parts are now located in every automotive industrial center, and resulting directly from this is the assembled tractor, of which type several were presented at the show.

Operator Must Have Comfort

Even though there is reflected throughout all the tractors a continuity of thought as expressed by the designer, there are many features as yet, that time and experience will no doubt improve, and a new method of procedure dictated. We find after careful study of all the tractors at the show that there is little regard for the farmer's comfort on many machines. In one or two cases there appears to have been an utter disregard for the serviceing factor. And there are many cases where the driving wheel lugs have been carried to such extremes that there is not even the faintest idea of consensus.

MOTOR AGE has discussed the seating problem before. The question does not seem to have been solved as yet. There are, to our minds, four important considerations, that should govern the designers hand in laying out the tractor seat. These are:

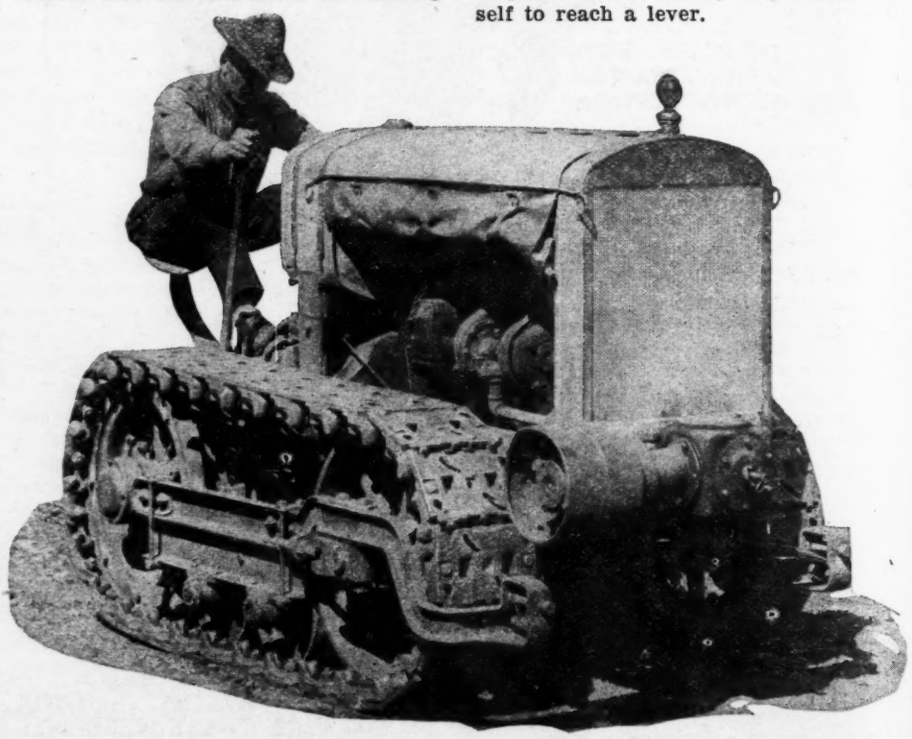
1—Safety. The seat should be rigidly supported yet flexible enough so that vibration will be overcome before it reaches the operator. The supports that hold the seat should be so located, and the seat so placed, that if the tractor struck an unavoidable bump severe enough to bounce the operator from his position there will be no danger of his being injured by a trailing implement.

Should Guard Against Injury

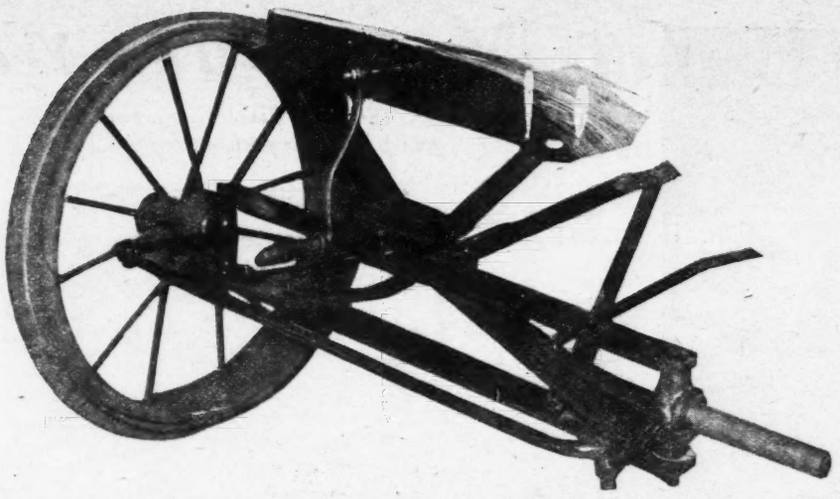
There are several cases where tractors in this respect are apt to cause severe bodily injury to the operator should any accident befall that would throw him from his seat. There is little provision for his grasping any part of the machine.

2—Comfort of the operator. The farmer is human and all possible measures should be taken to provide for his personal comfort. This includes the provision of sufficient leg room and ease with which access to and exit from the seat can be made. Also the vision of the operator must be considered.

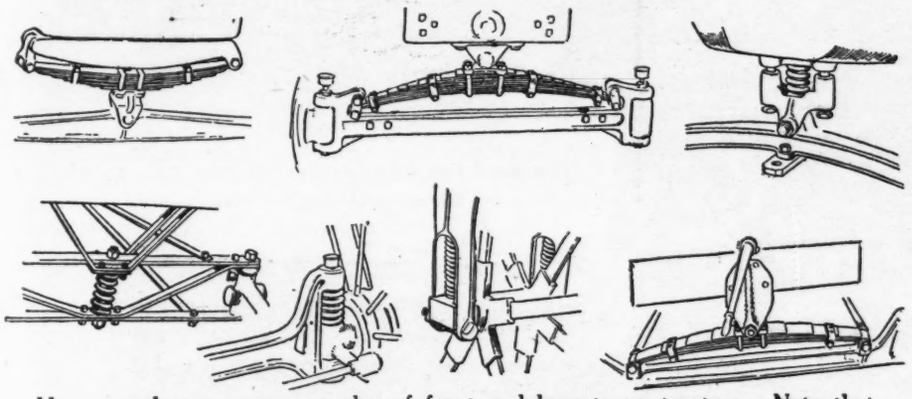
3—Ease of control. The foot pedals and hand levers should be within easy reach of the operator making it unnecessary for him to in any way strain himself to reach a lever.



This shows the power take-off on a crawler machine. It is a simple job to adjust a belt on a layout like this



This shows a more or less typical front axle construction on tractors, with tie rod in front and motor car type steering knuckles. A cross spring often supplements the construction



Here are shown some examples of front end layouts on tractors. Note that both coiled and leaf springs are used

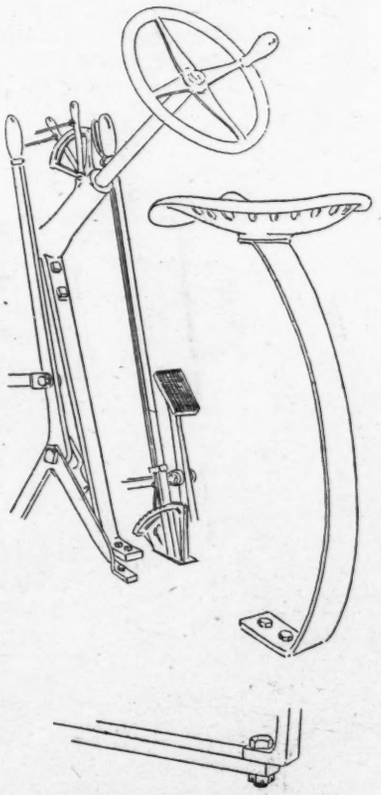
4—Access to implement. The seat should be so designed and constructed that implements can be reached by turning part way or all the way round in the seat if necessary, to reach the operating levers of the implement.

One can not help but feel while viewing the tractors and bearing in mind the considerations as outlined above, that there has been a lack of thought on this subject. On some of the tractors the seat is placed exactly in the center of the machine, and in the moving pictures that were shown along with the show, it was observed that the operator continually leaned toward the right side in order that he might better guide the tractor.

No Provision for Sun Shades

Another consideration which as yet has received very little attention, is the method for securing a canopy or at least an umbrella for the protection of the farmer from sun and rain. We may soon expect to see a bracket for the securing of the top or umbrella as standard equipment.

Then there is the question of price differences. Just why one tractor should list at a certain price and another tractor, having the same identical performing characteristics, pulling the same number of plows having an engine with the same rating, and alike in many other respects, should cost about two times as much, is a question that needs a satisfactory answer. Of course, we must not forget that it is possible to spend a good deal of money on construction, working out details and carrying the machine operations to much closer limits, but this should not make the great differences in price that there are existing now. A tractor is different from a motor car in this respect, where it is possible to spend untold amounts on upholstering, body finishing, and the like.



Above, an example of good tractor control layout with comfortable seat. Below, poor method of attaching radius rods

Spring Suspension

On many tractors there is a decided tendency toward a spring mounted front end. The springs are either a short transverse, shackled to the spring perches on the axle or else inverted and shackled to the perches on the cross member of the front end of the tractor, or for the other type a coil spring is used which is mounted at the center of the axle or in some manner to the wheel spindle if this type of axle is used. This tendency is a good one, and its use and general adoption is going to eliminate much trouble. Even if the action of the spring is slight, much of the jolt and jar will be absorbed. With the elimination of the greater part of this vibration, gasoline lines will be more permanent after installed, radiator connections will be strained less and the general wear and tear on the machine reduced all round. On a good many machine no spring is used, but a spring action is secured nevertheless because the axle is built up in a girder formation, which construction is naturally flexible and has certain shock absorbing qualities.

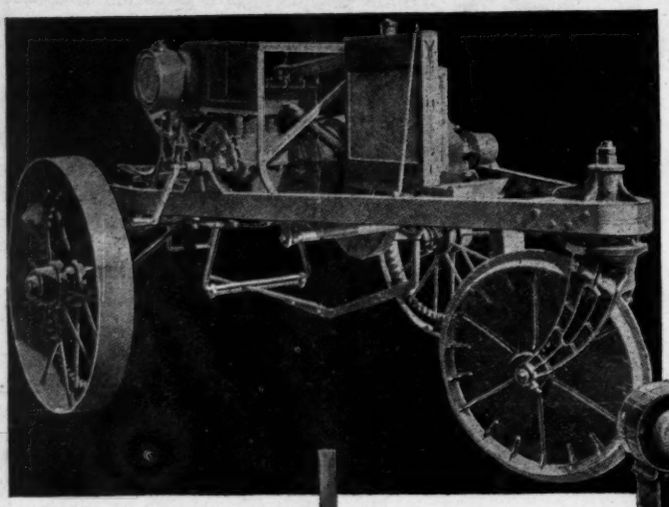
As regards the inclosure of the working parts there is still some development to be done on a great many of the machines. For example, there are still several machines where the pinion and bull gear drive is employed, where these gears are exposed to the dust and dirt. When valves are ground in, a paste made of some abrasive substance and oil is used to do the grinding. Now we would never attempt to lubricate gears with valve grinding compound, and still there are several exhibitions of this practice in this day and age. Dust and dirt mixed with oil, makes an ideal abrasive that for rapidity of wearing qualities can not be equaled. Many tractors have this problem worked to literal perfection. The gears are perfectly inclosed.

Novel Scheme for Protecting Gears

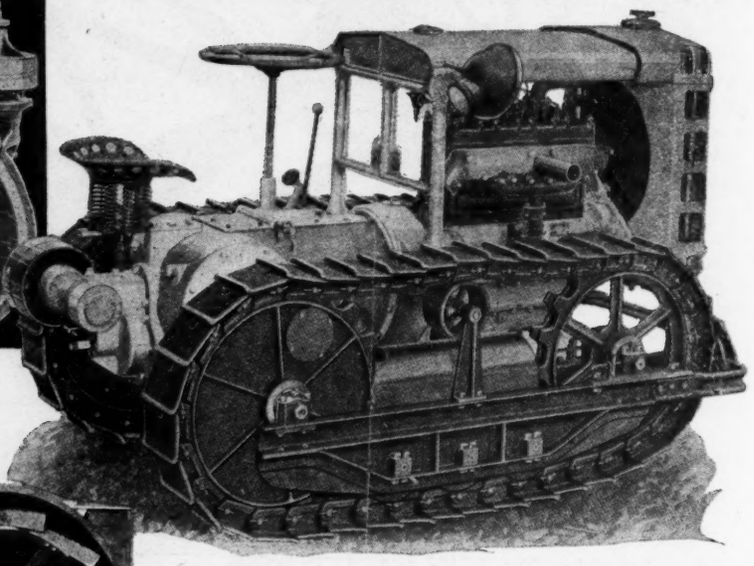
On one tractor in particular a scheme is employed that is novel but none the less important. The exhaust gases are directed to the housing of the gears, which naturally creates a higher pressure inside the gear housing than out in the open atmosphere. This pressure in the gear housing naturally relieves itself by blowing outward thus preventing the dust and dirt from gaining entrance to the housing. Inclosure is not being confined to the transmission end of the tractor either. We find now that there is distinctive trend toward in-

(Continued on page 18)

Tractors New This Year

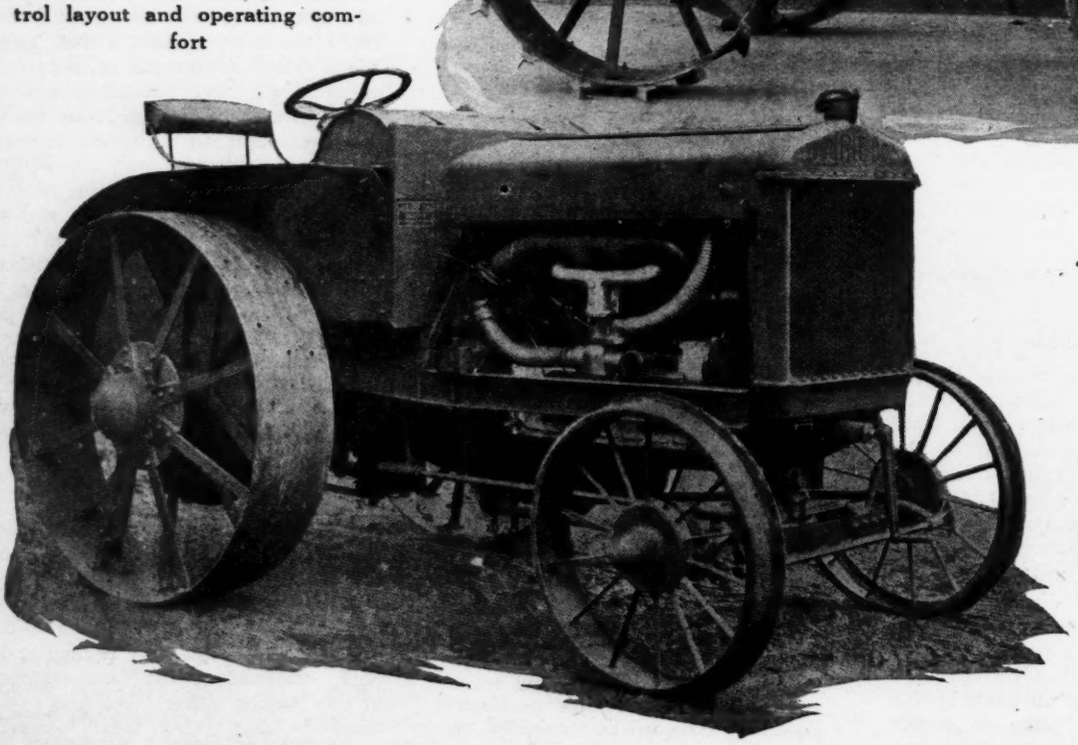


At the left, the new Parrett motor-cultivator which has a single front wheel



The new Franklin, a crawler type tractor of good design and many novel features

Above, the new Wellman, Seavers, Morgan tractor, noted for its rugged construction and accessibility. Right, the Wetmore, a clean-cut design with good control layout and operating comfort



The Prairie Dog, a product of Kansas City. This machine uses a four-cylinder engine and cast radiator, the latter being typical of many other new machines. Note the seat on this tractor and transverse location of fuel tank

Tractors Making 1920 Debut

Development Is Towards Machine Using Four-Cylinder Engine and Inclosed Drive—Motor Cultivators Popular. New Steam Tractor Makes Initial Appearance

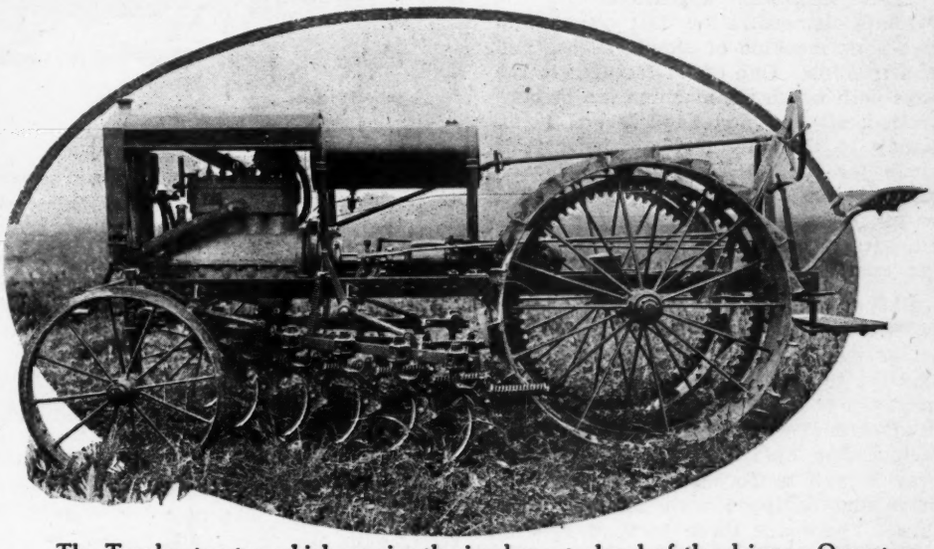
THE new tractors at the Kansas City show this year included machines of the wheeled type crawlers, garden tractors, motor-cultivators and one steam tractor, the Bryan. While all of the newcomers have been out for some time in experimental form, this was the first time they were offered for public approval. The descriptions that follow are those of the entirely new makes of machines, or of new models of makers already established.

PARRETT MOTOR CULTIVATOR

THE Parrett motor cultivator is a two row machine suited for all around farm work, such as pulling hay loaders, planters, disk harrows, operating feed grinders, wood saws, etc., in addition to its primary purpose of cultivating corn, cotton, tobacco and other raw crops. The tread and wheelbase are so proportioned that in turning around at the end of the field, no corn is run over.

The frame is channel steel, re-inforced with gusset plates and hot riveted. At the front a large semi-steel casting forms the steering gear retainer and front axle pivot. The front axle is of the yoke pattern, with 30 in. wheel. The rear wheels are 44 in. with cast-iron hubs on Hyatt roller bearings. Large radius rods on the rear axle permit of adjusting the mesh of the drive gears. Replacement costs have been reduced by making the internal drive gears on the rear wheels in segments, bolted to the driving angles.

The engine is a four-cylinder LeRoi, 3⅛ by 4½ in. with Eisemann magneto, Kingston carbureter and air washers.



The Traylor tractor which carries the implement ahead of the driver. Operating levers on this machine are very handy

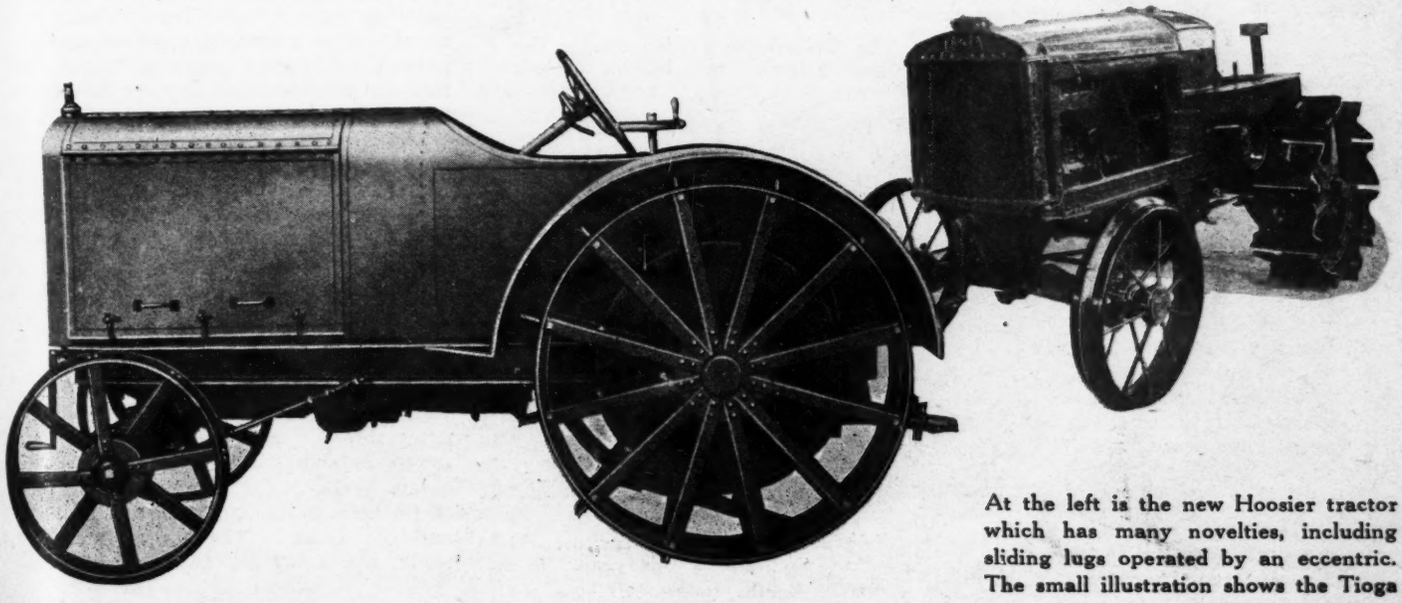
The engine is three-point suspended and mounted crosswise. The transmission is sliding gear, with a slow speed of 7-8 to 1 and 3 m.p.m. and a high speed of 2.75 to 3.6 m.p.h. The pulley is arranged so the machine can be backed into the belt. The machine is made by the Parrett Motors Corp., Chicago.

FRANKLIN

A NEWCOMER at the show this year is the Franklin, a crawler type machine, fitted with a four-cylinder Buda engine, 4¼ by 5½ in. and rated 30 hp. at 1000 r.p.m. The drive system is by independent clutches. The treads are 8 in. wide and have a traction length of 50 in., giving an area of 50 sq. in. The tractor is 86 in. long, 52 in. wide, and 52 in. high. The frame is built up of channels and angles. The job weighs 3500 lbs. and has three speeds, 2, 3, and 4 m.p.h., with a reverse speed of 1¼ m.p.h. The belt pulley is 10. in. in diameter and travels 2610 r.p.m.

Features of the engine include a Bennet combination kerosene and gasoline carbureter, centrifugal governor and Dixie magneto, with impulse starter. Cooling is through a Long tubular radiator and centrifugal pump. The fuel tank is placed above the engine.

The drive system, as well as the transmission, uses New Departure bearings. The steering wheel is of large diameter



At the left is the new Hoosier tractor which has many novelties, including sliding lugs operated by an eccentric. The small illustration shows the Tioga

and mounted on a vertical column. A feature of this tractor is the mounting of the seat, this being done by placing it on eight coiled springs. The tractor is made by the Franklin Tractor Co., Greenville, Ohio.

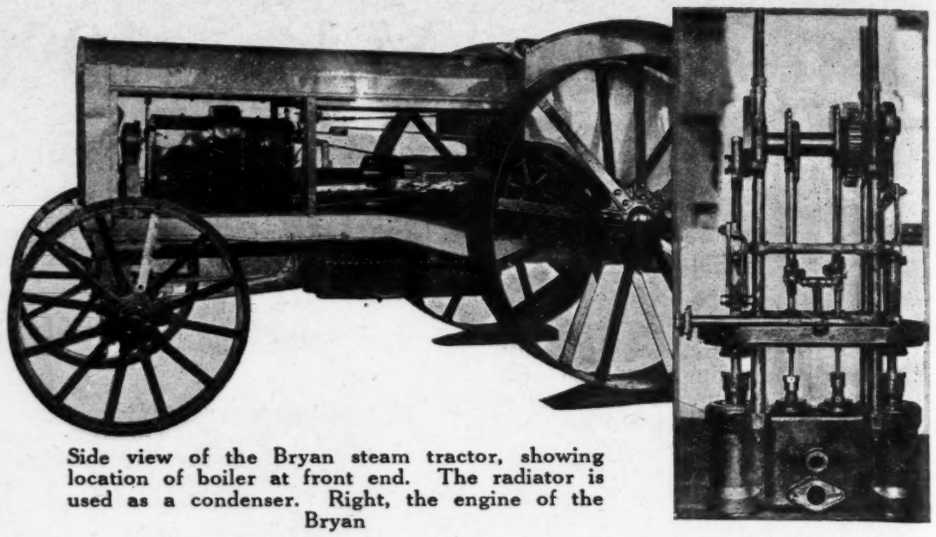
WETMORE

THE Wetmore tractor which made its first national appearance at the Wichita demonstration last year, is a two-plow machine of simple design and construction. One of its features is the ease with which the machine can be controlled, all foot and hand levers, being handy to the operator, with plenty of room for the latter's feet. The spark and throttle levers are on the left side, within easy reach. A coiled spring inclosed in the seat post adds to the driving comfort.

The engine is a Waukesha, 4 by 5¾ in. with a normal speed of 960 r.p.m. It is lubricated by a gear pump and ignition is furnished from a high-tension magneto. Anti-friction bearings are used throughout and all gears are protected from dust and run in oil. The rear axle is a Torbensen internal-gear drive and equipped with Timken bearings. There are three forward speeds, with direct on intermediate, which is the plowing speed of 3 m.p.h. High speed, or 5 m.p.h., is for road work, while the low speed is 2 m.p.h.

CASE

The J. I. Case T. M. Co., Racine, Wis., had on exhibition its new model 22-40 kerosene tractor, a job recommended to pull four 14-in. plows in hard soil and five plows under favorable conditions. It will drive on the belt a 32-54 thresher. This tractor will be fully described in next week's issue of MOTOR AGE.



Side view of the Bryan steam tractor, showing location of boiler at front end. The radiator is used as a condenser. Right, the engine of the Bryan

THE Triumph tractor belongs to the school of designers favoring rough open gearing for final drive. It is a three-bottom machine fitted with a 4¾ by 6 in. Erd engine. The horsepower rating on the draw bar is 18 hp., and on the belt 36 hp. The engine is a valve-in-head job, with inclosed governor, Dixie magneto, Kingston carbureter and Bennet air cleaner. The frame is channel steel, with the front end carried by a semi-elliptic cross spring from the axle. Steering is patterned after conventional automobile lines, with the tie rod in front of the axle to relieve it of compressional strains. The front wheels are 30 in. diameter and the rear wheels 48 in. All are mounted on Hyatt roller bearings. The forward speed of the tractor is 2¼ to 3¾ m.p.h., with a reverse speed of 2¼ m.p.h. With lugs and the tanks filled the machine is said to weigh 5000 lbs. Made by Triumph Truck & Tractor Co., Kansas City.

The Oldsmar, a garden tractor delivering from 3 to 5 hp. on the belt

The New Britain, another garden tractor, which is furnished in two models this year. It develops 6 hp. on the belt

ROCK ISLAND MOTOR CULTIVATOR

THE Rock Island Plow Co., which for some time has been manufacturing the Heider friction driven tractors has added a motor cultivator to its line for this year. The new machine has a distinct feature in that the operator need watch only the gangs and the front wheels of the cultivator will automatically follows the furrow. This is done by connecting up the gang mechanism control with the steering gear. The control is effected either by the steering wheel or by two foot pedals.

The machine is powered with a LeRoi engine, 3⅛ by 4½ in. and has the well-known Heider friction transmission, with final drive to the rear wheels by spur gears. Hyatt roller and U. S. ball bearings are used throughout. Although it is making its initial appearance at the show this cultivator has been in use for about 2 years as an experimental proposition.

The New Britain garden tractor, made by the New Britain Machine Co., New Britain, Conn., is offered to the dealer in two sizes. These differ only in width of tread, weight and type of drive wheel, etc. The object of varying the tread is that it is advantageous with some row crops to have the tractor run between the rows, while with other crops the row must be straddled. For the between row model the tread is 19 in., while for the larger model the tread is adjustable for all widths of tread between 28 and 33 in. The smaller machine, Model No. 1, weighs 650 lbs., is 36 in. high, 96 in. long and has a clearance of 7 in. The larger machine, Model No. 2, weighs 750 lbs., is 39 in.

(*Continued on page* 18)

Farm Power Business Has Brought Into Existence a New Type of Dealer

It Is Predicted That Within the Next Few Years We Will See a Great Many of These New Merchants Catering Exclusively to the Needs of the Motorized Farm

BY FRED M. LOOMIS
Motor Age Editorial Staff

THE farm power business has brought about a factor, which, it seems to-day, will have much to do with shaping the course of events in the industry and that factor is the establishment of a new type of dealer, an exclusive farm power dealer.

He is not the old implement dealer. He is not the motor car dealer. He is not the truck dealer or any other kind of dealer we have known. He is a new product, selling to the farm those things which are exhibited in the tractor show here this week.

He sells tractors, and all the machinery that goes with them, and generally also handles a motor truck of a size that is suited to farm use.

This new form of dealer is not any man's "new idea." He has simply come into existence through economic necessity. There was a need for him, and so "circumstances" brought him into existence. He is not yet numerous, and only time can tell whether he will become a dominant factor. There are old-timers, however, who believe the next few years will see the advent of a great many of these power farm men, catering exclusively to the needs of the man who wants to motorize his acres.

Why has the exclusive farm power dealer come into existence? He has come because the ideal man for carrying on the great work of motorizing the farms did not come in sufficient numbers from any other source.

In the first place, there was the old-time implement man who has been selling the old horse-drawn farm machinery for generations. Some looked to him to put the new products over, but he didn't generally measure up. True, in some cases he fitted himself to the new conditions and took up the work. But too often he did not. He was not equipped for the service which must accompany the new farm power apparatus, and he still believed he could call upon the factory or branch for service, as was the custom in the old days. But with bigger production the factory could no longer father its trade. It was necessary for the dealer to be a bigger factor and to take over the sale and care of the apparatus. The old-style implement man did not seem to possess the proper frame of mind.

There was then the motor car man. In many cases he stepped into the business and sold the tractor along with his cars and trucks. He was equipped for service, as the implement man was not, but sometimes he failed to fit himself in a sales way. It was mostly a matter of his lacking vision sufficient to see the possibilities in this about-to-be great business. Then a few men from various fields—including implements, motor cars, traveling salesmen and ex-threshermen, visualizing the possibilities of the power farm operative equipment business, began to get into the trade. These men did not believe it was necessary to break into the farmer's confidence through any of the old time channels, but went directly to him with the argument that only through power farming methods could he meet the labor and demand situation on the farm.

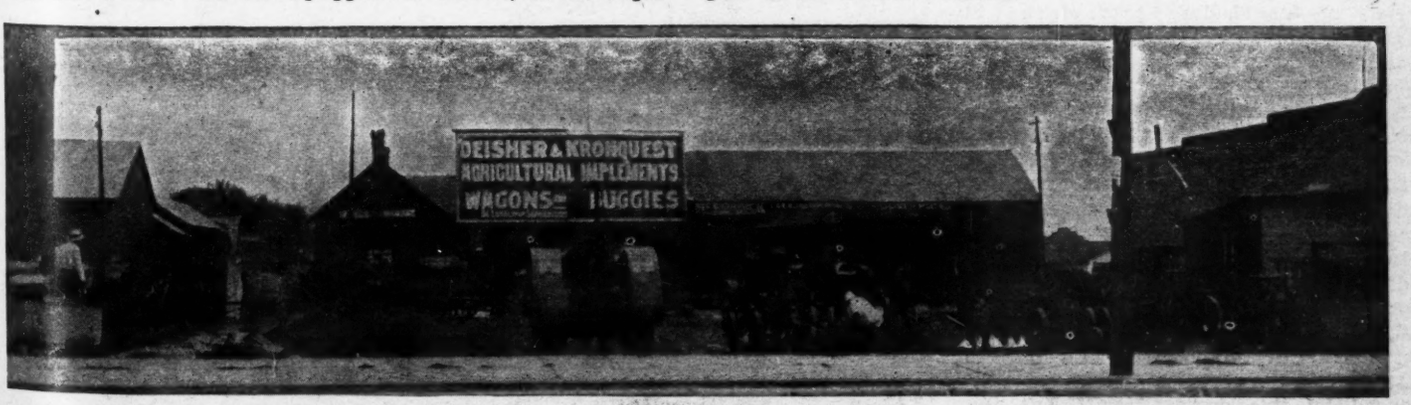
Concentrating upon this idea, as far as sales policy was concerned, they also conceived the notion that they had one other commodity to sell in addition to their goods and that was service. They equipped themselves for service, gave service and sold their goods upon that basis.

Financing came next. This they did for the most part by going to their banker and laying the cards on the table with him. To all intents and purposes the banker was taken into partnership with them, with the exception that the banker had no personal nor financial interest in the business. Sales were made in the private rooms of the banks and the deal was financed by the banker for both farmer and dealer.

These new dealers were given territory enough so that it was possible for them to reach the maximum volume to give them the maximum commission.

The tractor manufacturer and the branch houses manager welcomed this new kind of dealer because he did several things which dealers of other kinds did not do. He confined himself exclusively to the power equipment lines. He financed himself and from the very first could see no other plan than the spot cash method of doing business. He equipped himself for service both in a material way and in the matter of competent mechanics. He was a source of profit to the concern because he called upon it for none of the things the old time retail implement dealer persisted in calling for. These things account for the welcome which has been accorded to him and afford an explanation of why he is being encouraged by the tractor manufacturer.

From a distribution point of view this is the most interesting, if it is not the most important, development of the year past in the tractor business.



This shows the old building which for a generation was enough for a concern of old-time implement dealers who in the last year have built a new structure devoted exclusively to farm power equipment

Tractor Accessories Show Useful Purpose

Great Contrast Between the Accessories for Tractors and Those Used on Motor Cars

THERE was a marked contrast between the type of accessories exhibited at the tractor show in Kansas City last week and accessories that are now being marketed for motor car use. Every tractor accessory shown had a real field of application. The accessories served a real purpose. No accessories were exhibited that were complements to some other already existing accessory, or in other words there were no accessories for accessories. Tractor manufacturers will

Eclipse valve grinder of the electric type has feature of being light in weight

no doubt equip their machines in the near future with some recommended standard bracket for canopies and umbrellas and this step will create a variety of sun shades all of which will serve a real humanitarian purpose, providing some degree of comfort to the farmer.

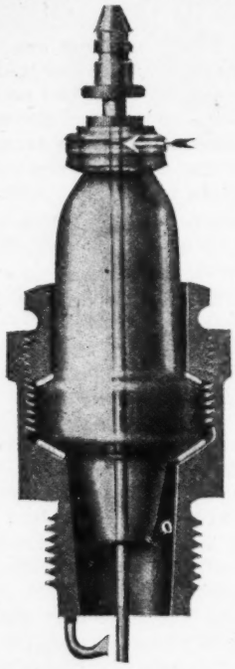
An interesting development that will aid the farmer in the performing of night work is the series of lighting generators made by the K-W Ignition Company, Cleveland, Ohio. This company makes a series of generators that can be applied to almost any tractor. In some cases the drive is by a small leather belt and in other cases the frictional contact between the engine flywheel and the driven friction wheel of the generator is employed. At present the series of generators produced by this company will suit the Avery tractor, the Case, Mogul, Big-Bull, Waterloo Boy, Velie, Holt, Coleman, Frick, Heider, Hart-Parr, Prairie Dog and Leader tractors. No storage battery is used, the current being taken directly from the generator.

Two interesting exhibits were the Bosch magneto display and the testing bench made by Becker Bros. of Chicago. The Bosch display showed an electrical test bench for the testing of magnetos, generators, and starting motors. The test bench shown in the illustration is the one displayed by Becker Bros. This bench is furnished with a 2 hp. electric motor, the purpose of which is to drive the machines to be tested. A friction drive transmission is used with which it is possible to secure any speed from nothing to 4000 r.p.m. A clock type tachometer is used which indicates the speed of the driven machine. A universal test vise is rigidly secured to the table of the bench. This vise is designed to hold any type of generator, starting motor or magneto while it is being driven. A series of plugs is located on the front of the test bench from which wires lead to the voltmeter and the ammeters on the panel board. A spark tester is also fitted which shows the operation of the high-tension circuit of the magneto. The spark gap of this tester can be varied by turning a knurled thumb-screw. An interesting means is employed to test starting motors. The motor is secured in the vise and a lever arm attached to a universal jaw chuck which holds the shaft of the armature. By attaching the cables from the storage battery of the bench to the starting motor the actual torque of the motor is registered in pound-feet.

Steering from Binder

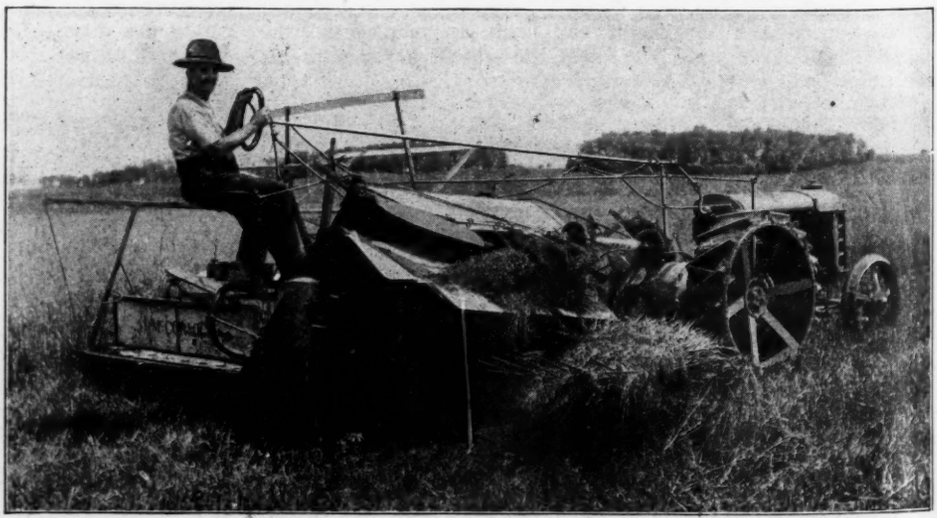
The Steer-a-Tractor device made by the Sella Mfg. Co., Des Moines, Ia., enables one man to operate a Fordson or a Samson tractor that is operating with a binder. The steering wheel is operated through a long extension arm fitted with three universal joints and the clutch lever is an extension that together with the throttle furnishes complete control of the machine.

G. T. O'Maley, Fordson distributor of Kansas City, had without doubt the most

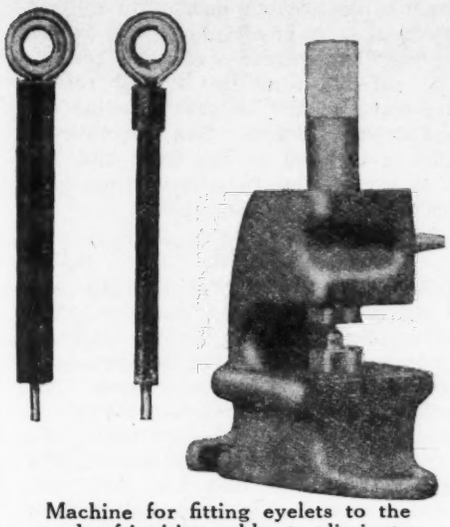


Spark plug made by the Penn Mfg. Co. and designed for heavy duty in tractor and truck engines

complete display of service equipment tools shown at the show. The machines on display and in demonstration were: American Universal burning-in-stands, engine stands, lathes, drill presses, power saws, straightening presses, arbor-presses, cranes, forges, hoists, chain-blocks, over-head track and trolleys, line shafting, hangers, pulleys (wood or



Steer-a-Tractor enables one man to manipulate the controls on a Fordson or Samson tractor that is operating with a binder



Machine for fitting eyelets to the ends of ignition cables to eliminate frayed and worn wire connections

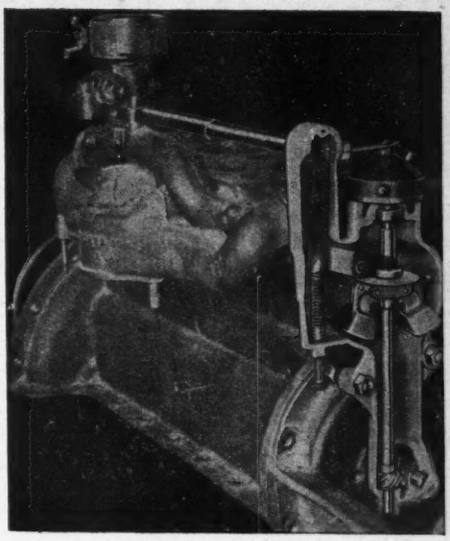
steel), burmaline belting, main bearing rebabbitting jigs, main bearing reboring jigs, marvel cylinder boring machines, cylinder boring tools, connecting-rod straightening jigs, piston clamps, arbor bushing drivers, axle straightening bars, bending bars, testing bars, turning bars, sleeve pullers, radiator test plugs, one-man tow bars, speed wrenches, special wrenches, special reamers, engine dollies, jiffy garage jacks, Wagner electric motors (¼ to 50 hp.), and tractor lamps.

The Penn Mfg. Co., Kansas City, Mo., displayed a new spark plug designed for heavy duty work in tractor and truck engines, the electrode in this plug consists of a knife blade edge from which the spark radiates in a fan shape. An intensifier is incorporated in the plug, the shell is of two piece construction, the shell and bushing closing down on the ferrule of the insulator where two copper asbestos gaskets are located. The nickel plated shell and the bushing are Parkerized, a process that prevents rusting. The plug is sold under a thirty day satisfaction plan.

Canfield Governor

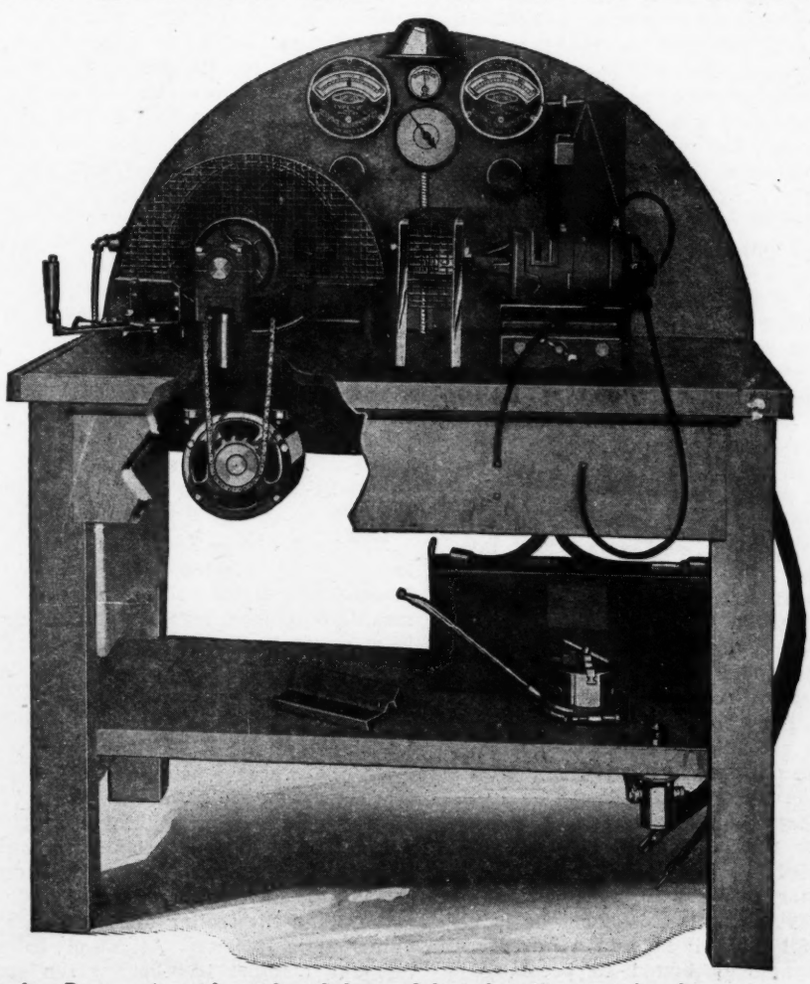
The Canfield governor is a mechanical device that controls the speed of the Fordson tractor engine. The governing action results from the centrifugal effect of the revolving weights. As the engine speed increases these weights raise the arm of a bell crank which control the valve. This governor is particularly well made, ball bearing construction is used throughout. The timer which is set in a raised position is fitted with a self-oiling lubricating cup. The working parts are all inclosed and wear caused by dust is therefore eliminated. This governor is distributed by the O'Maley Tractor Co., Kansas City, Mo.

The Eisemann Magneto Co., Brooklyn, N. Y., exhibited an interesting little machine that fitted eyelets to the ends of electric cables, thus eliminating the difficulty encountered with frayed and worn wire connections. An electrical connection made with a terminal fitted in this manner assures a perfect contact. The eyelet is pressed on to the cable in a fashion that makes it almost impossible to pull the wire out from the eyelet. Two sizes of eyelets are furnished with this machine, the larger size having an opening of 13/64 in. and the smaller 11/64.



Canfield governor for controlling the speed of the Fordson tractor engine. The working parts are all enclosed

The Eclipse Valve Grinder Co., Sub-Freight Station Bldg., Kansas City, Mo., exhibited a new valve grinder of the electric type. The features of this valve grinder are that it is light in weight, consumes a small amount of current, and gives an oscillating motion to the valve. The valve bit is large in size and will not bur the valve slot. The machine is entirely inclosed. It is sold complete with valve bits lifting springs, flexible cord, and separable attachment plug.



Becker Bros. universal test bench has a 2 hp. electric motor for the purpose of driving the machine being tested

TRACTORS TO CLEAR ROADS OF SNOW

Buffalo, Feb. 20—While army red tape prevented the use of tanks to clear the roads of Western New York, closed by snow for the last six weeks, farm tractors have been used with such success in this work that they will be generally used for this work next winter, it is believed.

Efforts were made to obtain use of the huge tractors that haul the guns of the 65th Regiment, Field Artillery, stationed in Buffalo, for road clearing, but permission of the war department was slow in arriving and the Buffalo officers would not give their permission to use the tractors.

Ordinary farm tractors were tried out in the vicinity of Alden and elsewhere and succeded in smashing their way through drifts which for a month had closed the roads to all traffic. With the exception of roads in which there are trolley lines, which were kept open by snow plows, no western New York roads have been in passable condition for weeks. The roads closed included the much used Niagara Falls boulevard.

Tractors Making Their 1920 Debut

Development Is Towards Four-Cylinder Engine

(*Continued from page* 14)

high, 98 in. long and has a clearance of 10 in.

The engine is the same in both models, being a two-cylinder, of the company's own make, with 2¾ by 4 in. bore and stroke and 1500 r.p.m. It burns gasoline and develops 6 hp. on the belt. The pulley is 5½ by 4½ in. and is in front, directly connected with the crankshaft.

WELLMAN-SEAVER-MORGAN

A TRACTOR of up-to-date design was exhibited by the Wellman-Seaver-Morgan Co., a large machinery concern that recently has entered the manufacturing of tractors and engines. The tractor engine was designed by Joseph Van Blerck, who has had much experience with marine gas engines and the tractor was designed by John Riise.

HOOSIER TRACTOR

THE Hoosier tractor which was one of the debutants at the Kansas City show last week, attracted attention because of the original way in which the method of securing traction is worked out. This tractor aside from the one or two innovations in construction is like many other new tractors in that its parts are standard, being made by well known parts makers. In appearance the Hoosier presents itself as a tractor worked out to eliminate trouble from dust and dirt, because it is practically all inclosed.

THE OLDSMAR

THE Oldsmar a new garden tractor, is made by the Oldsmar Tracor Co., Oldsmar, Fla., after a design for which R. E. Olds is responsible. It has a weight of 1000 lb. and will deliver from 3 to 5 hp. on the belt. It is designed for garden work and for the cultivation of row crops and has a clearance of 16 in. The engine is a single cylinder, air cooled, 5 by 5½ in. bore and stroke, with a normal speed of 580 r.p.m. The tractor is 36 in. wide, 36 in. high, 72 in. long with drive wheels which have a height of 32 in. and a tread of 4½ in.

TRAYLOR MOTOR CULTIVATOR

THE Traylor, a newcomer at Kansas City this year is a 6-12 hp. machine for universal purposes on the farm. It is easily adjusted from its normal clearance of 16 in. to 26 in. for cultivating. This is an exclusive feature. The drawbar pull of this job is 650 lbs., and it weighs about 1700 lbs. The engine is a 3⅛ by 4¼ Le Roi, with four cylinders and water cooled through a honeycomb type radiator. The magneto is a Dixie and the carbureter a Kingston. The fuel tank has 10 gal. capacity and is placed above the engine.

The clutch is a Borg & Beck, while the transmission is the company's own make. It is fitted with one speed ahead and one reverse. Plowing speed is direct. The gearset is of the sliding gear type. All bearings are of anti-friction type. Front wheels and rear wheels are 28 in. and 38 in. in diameter respectively. Final drive is through roller type of pinions and bull gears fastened to the rims of the rear wheels. The Traylor is made by the Traylor Engineering & Mfg. Co., Allentown, Pa.

BRYAN STEAM TRACTOR

ONE of the new tractors at the show which created much interest was the Bryan light steam tractor, made by the Bryan Harvester Co., Inc., Peru, Ind. This tractor marks a new step in tractor practice. For the first time in tractor history this machine uses a high pressure superheated steam boiler, with a steam atomized fuel burner, in a form that makes it entirely possible to use the very lowest grades of fuel.

In outward form this tractor resembles many of the inclosed gasoline engine driven tractors. The conventional radiator is fitted on the front end, but in this case the radiator serves as a condenser for exhaust steam.

TIOGA

THE Tioga is a new job this year and is a four-wheeled machine. The power plant takes in a four cylinder Wisconsin engine, with a bore and stroke of 4½ by 6 in. respectively. The engine uses a Dixie magneto, Stromberg carburetor and an oil governor. The transmission is completely housed in a dirt and oil-tight case and has two-speeds forward. The power pulley, also, has two speeds. The brake arrangement is such that it cannot only be used to stop the tractor or check its speed on hilly work, but also to anchor it for belt work.

Good and Bad in Tractor Design

A Study of Exhibits at Kansas City Show

(*Continued from page* 11)

closure of the fan drive, that is the fan is now being driven in a great many cases by an inclosed gear train. The argument for this is that a belt gets very little attention on the farm, and even though the belt appears to be going around much in the manner that it should, there is a good possibility that the farmer has not attended the belt drive for some time and that it is consequently slipping and not performing as it should.

Consider Power Take-Off

The ease with which the belt may be applied to the power take-off pulley is a factor that deserves consideration. It does not seem to be unreasonable that the belt should not be taken apart at the splice in order to fit it to the pulley. Neither does it seem reasonable to take off a wheel of the tractor in order to apply the belt, even though a very ingenious scheme has been worked out to facilitate this removal. The majority of examples indicate that a power take-off pulley should be located in a transverse position. It is easier, very much, to tighten the belt from the tractor to the thresher by moving the tractor an inch or two in the direction of its natural travel, than to skew the tractor over with a crow bar.

There are a few more things that one will note on close inspection of the tractors that were exhibited at the show. For instance on one machine the filler plug for the lubrication of the engine is located directly over the magneto. No matter how careful the operator is, some day when time is short he is going to fill that oil hole in a hurry and the magneto is bound to become bespattered with oil. Now of course magnetos are made dust and water-proof we admit, but a good bath of oil will do the magneto no particular good.

Wheel construction is receiving marked attention. The question of lug construction being of related interest has come in for its share of consideration. This year sees various companies prepared to fit lugs to the wheels suitable to the needs of the particular fields in which the tractor is going to be used. So important has the lug problem become that we find one company equipping their machine with a patented lug that is adjustable in the depth of its bite, the adjustment ranging from nothing to about three inches. This lug is set on an eccentric and recedes completely into the wheel at each revolution thus automatically cleaning itself. Some wheels are being made with two sets of spokes to the wheel. One set supports the wheel, and the other set being heavier, but fewer in number takes the driving strains.

Radius rod construction needs to be improved in a good many ways. On some tractors the radius rods were not meant to perform any duty, if their size is an indication of what is needed. One machine in particular uses a radius rod hardly sufficient in size to hang a lace curtain on, yet it is supposed to stand the strains of every bump in the road.

On the whole tractors this year are more accessible, lighter in weight, have better facilities for obtaining traction, are better built, and cost slightly more. Quality and accuracy of construction seems to have imbued the makers, rather than the feeling of making a machine at a price. Attention to the farmer's comfort has been given some consideration but more in this respect remains to be done.

Farm Lighting Plants at Kansas City Show

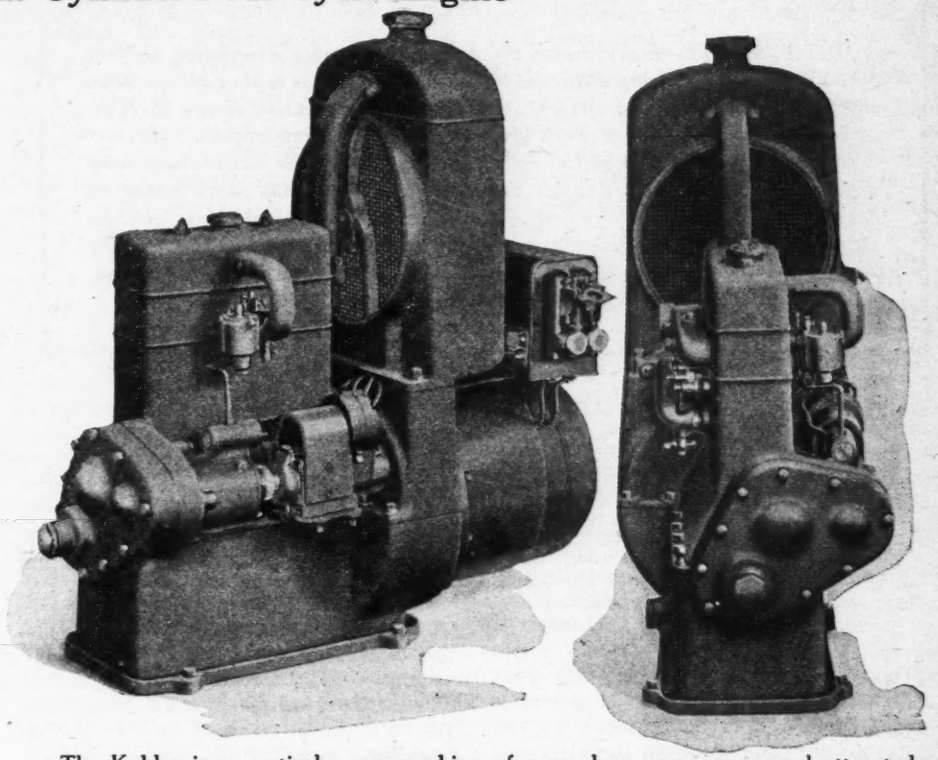
Two New Outfits Exhibited for the First Time—Kohler Has a Four-Cylinder Four-Cycle Engine

SEEMINGLY making a bid for a place in the farm power equipment field, six farm light representatives were at the show. The machines represented were of the battery type and automatic type with the automatic type holding the majority. One entirely new machine was presented by a company just entering this particular branch of the farm power equipment business, the Kohler, made by the Kohler Co. of Kohler, Wis., makers of enameled plumbing ware.

All of the farm light exhibitors had their machines set up for representative operation, and it was the particular delight of every visitor to the show, to push the button of the system and view the plant in operation.

The one plant that attracted wide attention was the Kohler. This plant is of the automatic type, having a four-cylinder four-cycle gasoline burning engine, equipped with an automatic mechanical governor. The engine is of the block cast type. Its operating speed is 1000 r.p.m., which is fast enough to eliminate the vibration that is generally characteristic of the automatic light.

A 24-volt battery is used, whose purpose it is to start the engine only. During operation this battery is charged from two taps into the controller unit, that supplies ampere charge at all times.

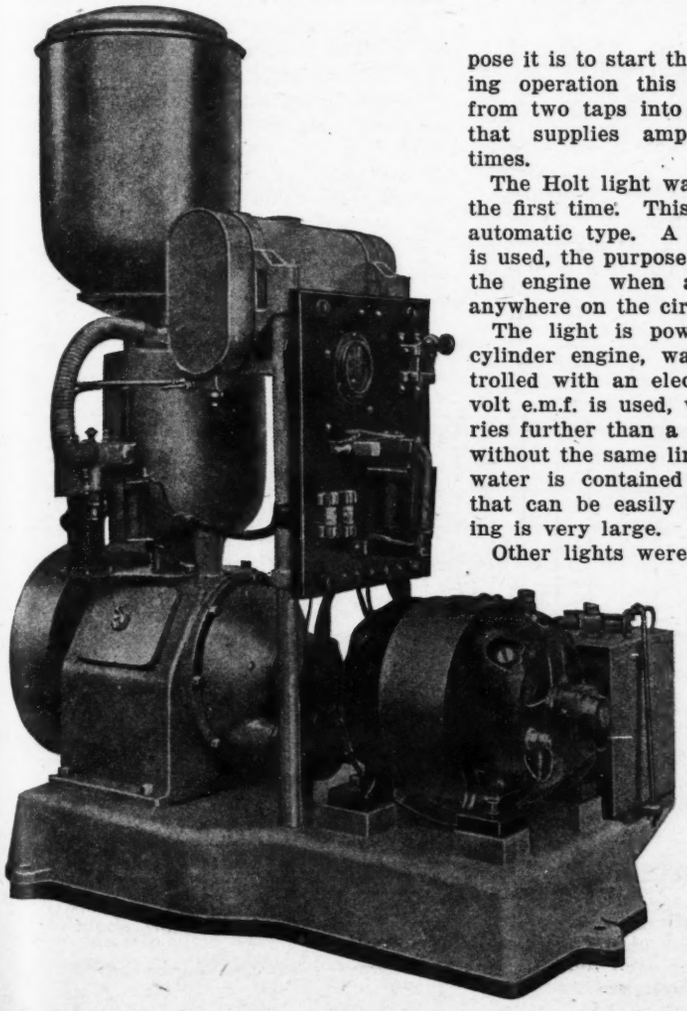


The Kohler is an entirely new machine of very clean appearance and attracted much attention at the show

The Holt light was also exhibited for the first time. This light is one of the automatic type. A low voltage battery is used, the purpose of which is to start the engine when a button is pushed anywhere on the circuit.

The light is powered with a single cylinder engine, water-cooled and controlled with an electric governor. 110-volt e.m.f. is used, which naturally carries further than a 32-volt pressure and without the same line loss. The cooling water is contained in a large hopper that can be easily filled, for the opening is very large.

Other lights were on exhibit, but because they have been described and illustrated in MOTOR AGE from time to time we merely make mention of them here. The Alamo light is driven by an engine in which a rather novel valve construction is employed. Sleeves are used, but the operation of the sleeves is different from the ordinary because a rotating motion is given the sleeve valves. This construction is claimed to reduce vibration to an extent where it is unnoticeable. The Willys light was displayed. This light is of the battery type operating on 32 volts. The engine is of the Knight sleeve-valve type.



The Holt light is of the automatic type having a low voltage battery to start the engine when a button is pushed. It is water-cooled and the cooling water is contained in a large hopper that can be easily filled

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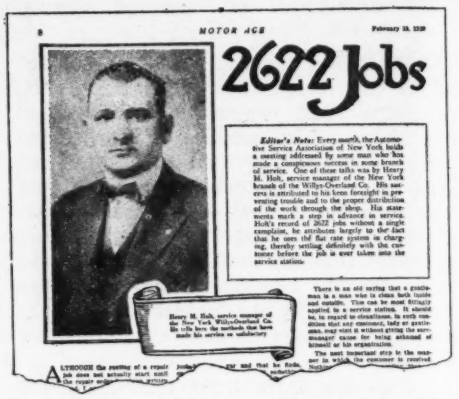
INDIANA TAX LAW UNCONSTITUTIONAL

Indianapolis, Feb. 23—The Deem law, fixing license fees on automobiles and motor trucks, passed at the last session of the Indiana General Assembly, is unconstitutional, according to Judge Pritchard of the Indianapolis City court. The case will be carried to the higher courts for adjudication. The test is coming from the Indianapolis Chamber of Commerce, representing the truck owners of the state. The law increased the license tax on trucks of more than 450 per cent. Contention is made that the law is unconstitutional because the title does not express the substance of the act, because the law is discriminatory in providing a truck highway tax and permitting a similar tax to be levied by the cities.

ROUTING A CAR

EDITOR'S NOTE—Every month, the Automotive Service Association of New York holds a meeting addressed by some man who has made a conspicuous success in some branch of service. One of these talks was by Henry M. Holt, service manager of the New York branch of the Willys-Overland Co. His success is attributed to his keen foresight in preventing trouble and to the proper distribution of the work through the shop. His statements mark a step in advance in service. Holt's record of 2622 jobs without a single complaint, he atttributes largely to the fact that he uses the flat-rate system in charging, thereby settling definitely with the customer before the job is ever taken into the station.


MOTOR AGE February 19, 1920

2622 Jobs

Editor's Note: Every month, the Automotive Service Association of New York holds a meeting addressed by some man who has made a conspicuous success in some branch of service. One of these talks was by Henry M. Holt, service manager of the New York branch of the Willys-Overland Co. His success is attributed to his keen foresight in preventing trouble and to the proper distribution of the work through the shop. His statements mark a step in advance in service. Holt's record of 2622 jobs without a single complaint, he attributes largely to the fact that he uses the flat rate system in charging, thereby settling definitely with the customer before the job is ever taken into the service station.

Henry M. Holt, service manager of the New York Willys-Overland Co. He tells how the methods that have made his service so satisfactory

There is an old saying that a gentleman is a man who is clean both inside and outside. This can be most fittingly applied to a service station. It should be, in regard to cleanliness, in such condition that any customer, lady or gentleman, may visit it without giving the service managers' cause for being ashamed of himself or his organization.

The most important step in the manner in which the customer is received

ALTHOUGH the routing of a repair job does not actually start until the repair order

car and that he feels

Reproduction of last week's story by Mr. plaints and carried a typical job through

In Two Parts—Part II

LAST week Mr. Holt told the requirements of a good service organization, wherein a job is handled from the time the owner drives in, trouble diagnosed and repair contract made and the car is ready to be sent to the shop.

On the following pages Holt tells of the system he has for routing a car through the shop which has been so successful in eliminating complaints: How such jobs are handled, the layout of the departments, how tools and the workmen's time are kept and recorded, keeping a stock of repair parts and the final inspection and test of the car.

THE car is now sent to the shop. This should be done by a car chaser or a driver engaged for that purpose, as the tester's time could be used to better advantage. A record should be kept of the time it takes from the moment the order is signed until the car has reached the shop. From one-half to one hour should be quite sufficient and if it takes any longer, something is wrong and the cause of the delay should be investigated.

It may be also mentioned that some service stations maintain what is called "quick service," or small repair department. Such department, where the building conditions allow it, is commendable as there are many small jobs which can be done in less time by this department than would be the case if it had to go through in the regular manner of shop routine.

Our car has now reached the shop floor and a few words should be said in regard to the lay-out of the shop. There is one thing which in most shops has received very little attention, and that is the location of the shop superintendent's office. This may be either an inclosure or a desk, but it is extremely vital as to where it is put. In a great many shops it will be found that this often is placed in a corner from which no view of the shop can be obtained. If possible, the location of this office should be such that each car that comes to the shop should pass it, and each car that leaves the shop should again have to pass it. The reason for this is that a copy of the work order should be delivered to the shop foreman immediately the car enters the shop. He will then know when the car is in his care. Preferable the floor of this office should be raised at least six to twelve in. above the shop floor.

Dividing the Shop Into Departments

The car is now ready for the actual work. The practice of dividing the shop into various departments, such as engine, rear end, miscellaneous, electrical body, etc., has been found to be the most practical. Often the question is asked: "What has become of the old-time mechanic who could overhaul a car from the front of the radiator to the back of the differential." It is hard to tell. Maybe he is now a service manager. One

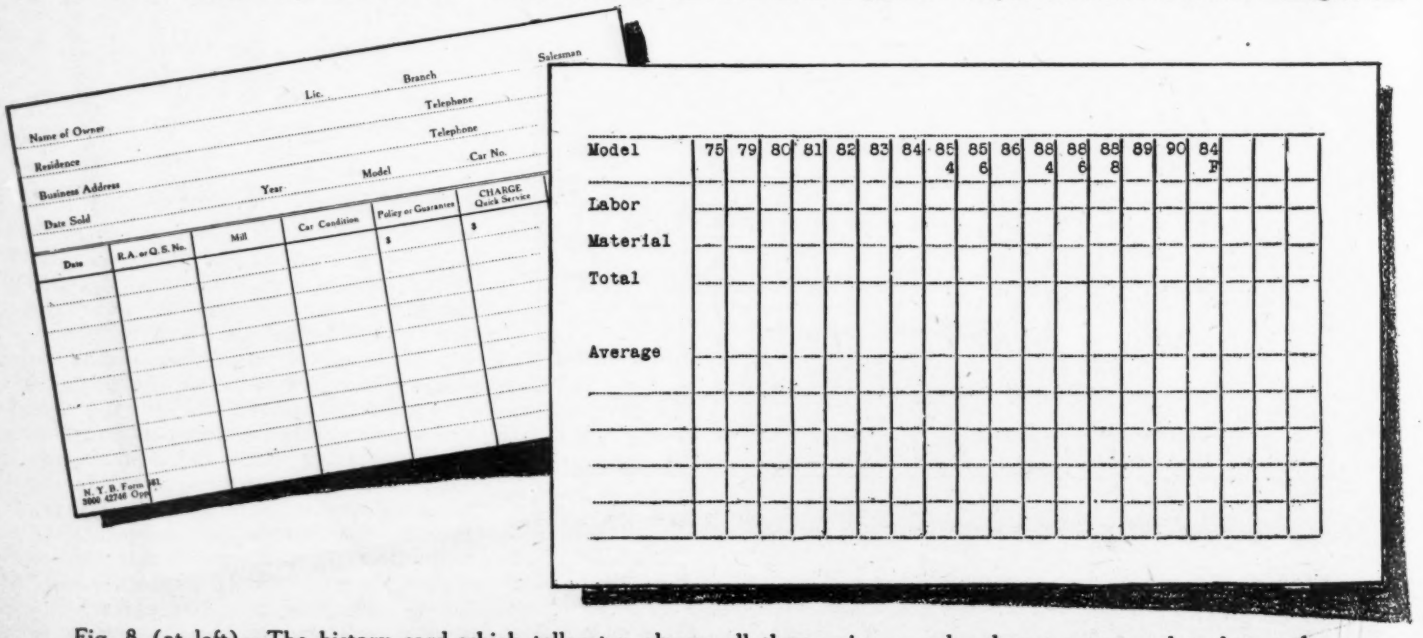


Fig. 8 (at left)—The history card which tells at a glance all the service or sales departments need to know about the car. The reverse is a continuation of the columns

Fig. 9 (at right)—Estimator's card which gives the details of each operation so that future estimates can be based on past performance

THROUGH THE SHOP

February 26, 1920 MOTOR AGE 9

Without a Complaint

How the Service Manager of One of the Largest Service Stations Routes Through Jobs So Successfully That He Has Not Gone Wrong on a Single Job

Dividing the Shop Into Departments Has Helped to Eliminate Complaints

Holt, wherein he told of eliminating complaints as far as the shop.

thing is certain—he is almost extinct, and it is very doubtful if his services would be more valuable today, when the shop methods are gradually being patterned after the factory.

Let us assume that our shop is departmentized. The shop superintendent or his assistant will distribute a copy of the work order to the head of that department which is to do work on the car, who in return will put mechanics to work. Another advantage of having the shop divided into various departments is that the number of men that come under the supervision of each department head would be a great deal smaller than if the whole shop was in charge of a single man. Better work is therefore assured. It is, of course, essential that these departments should work in harmony with each other. Let us take, for instance, the job of "removing carbon and grinding valves." As soon as the valves are removed they should be sent to the machinist, who will true up the stems and will take a small cut off the valve seat, thereby removing all pits and ridges. When the valves are done they are returned to the mechanic, who by this time has removed the carbon and reset the valve seat in the cylinder block, and is ready for the actual grinding of the valves. By applying this method of team work to other operations, the length of time to do the work can be greatly reduced.

Recording Time Expended on Each Job

When a mechanic has been instructed to start work on a car it is essential to good service the time when he starts should be recorded. The old-fashioned method of allowing the mechanic at the end of the day to give an account of how he has expended his time during the day is as much up-to-date as selling repair work on a time and material basis and the two ought to go hand in hand, for if the mechanic is working on a car that is owned by a friend or by a customer who is generous with his tips there is an excellent chance to make the labor on this job very small. It is, of course, understood that some other unfortunate customer would have to pay so much more. There are various timeclocks on the market for the purpose of stamping the mechanics' time and no shop should be without one. Some service stations make a practice of writing out a time ticket for each individual operation. Although this is a splendid idea, too much time may be taken up in changing tickets. A different time ticket should, however, be made up for work which is gratis and work which is to be paid for.

Task Limits and Standard Working

Task limits and standard working methods are most essential to the proper routing of a job. Although it may seem a big job, the shops who have tried it have been immensely benefited by having books printed that explain the working methods of each operation. By applying this practice each mechanic will know exactly what to do and how to do it. He will know exactly what nuts to remove in order to quickly disassemble the unit on which he is working. A mechanic should be made to understand that a certain time limit is allowed for each operation. This limit, of course, should be liberal enough to give him sufficient time to do the work properly. It should be the duty of each department head to cheerfully give the mechanic any information that will enable him to do his work better. No one has ever been benefited by carrying secrets to their grave and if any department head is withholding valuable information be-

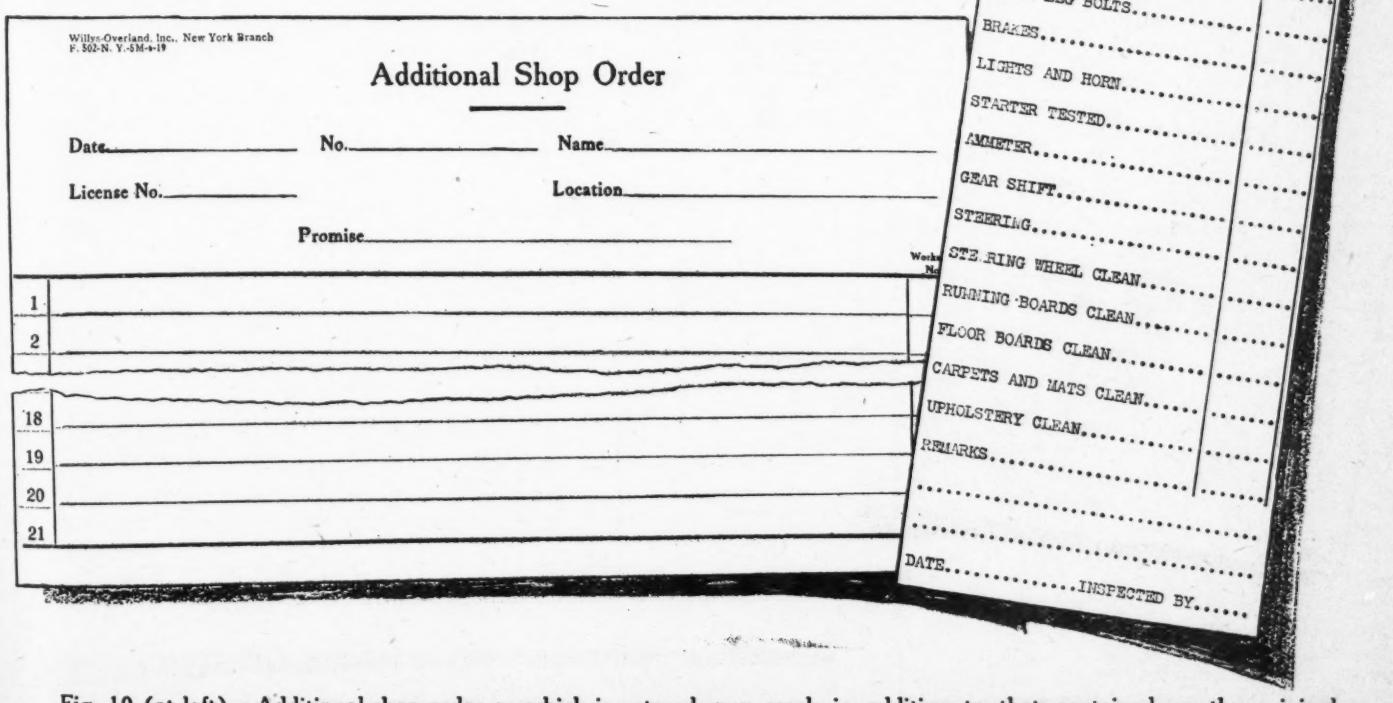


Fig. 10 (at left)—Additional shop order on which is entered any work in addition to that contained on the original repair order. Work included under "Inspection and Report" is entered on this form, which is on pink paper
Fig. 11 (at right)—Final inspection report which is a rubber stamp which is stamped on the back of the instruction card when the work has been completed

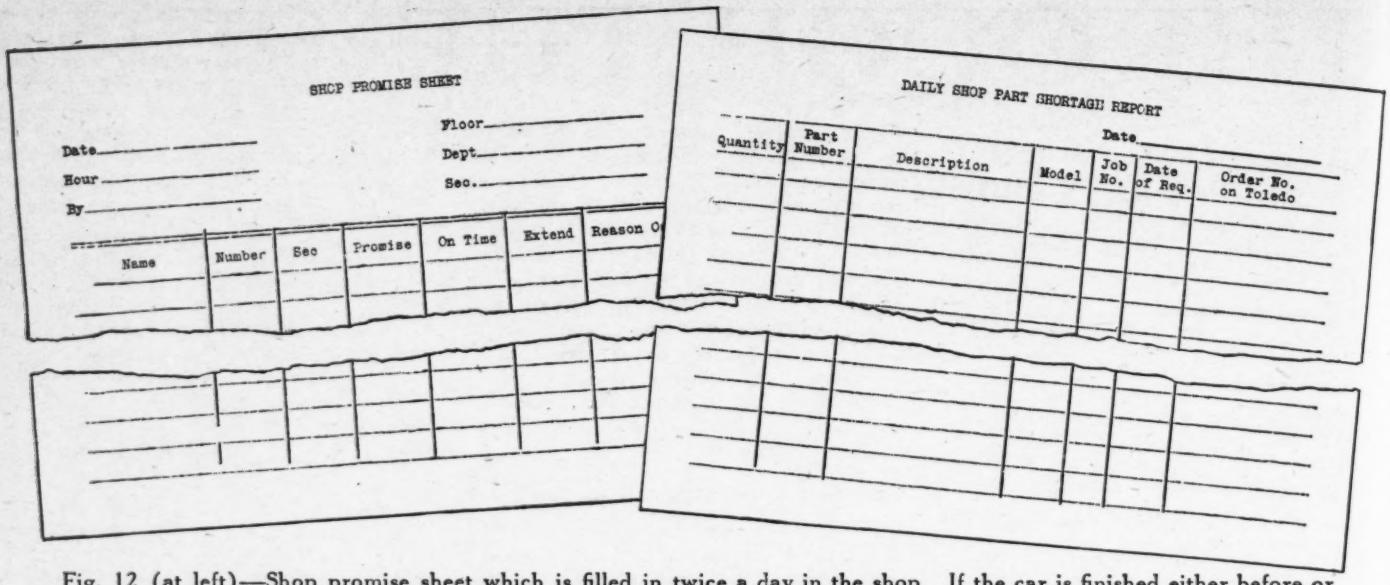


Fig. 12 (at left)—Shop promise sheet which is filled in twice a day in the shop. If the car is finished either before or after the time promised, the customer is notified

Fig. 13 (at right)—Daily shop part shortage report which is rendered daily in duplicate. One copy goes to the parts manager and one to the service manager

cause he thinks that someone may learn to know more than he, which may result in his losing his job, he is not only on the road to lose his job, but his superior should assist him towards this end as he is certainly not an asset to the organization.

Tools and Equipment

Many of the difficulties experienced in routing a job could be eliminated if the shop is in possession of modern tools and equipment. Such practice as furnishing the mechanic with tools made especially for the cars on which he is to work is certainly commendable, as the mechanic who specializes in using a monkey wrench, a chisel or a hammer more than any other tools is liable to do more damage than good. The same goes for the man who still uses a screwdriver when grinding valves. Tools can be obtained for almost any purpose and the money invested for such purchases will be well spent. An adequate checking system of tools borrowed from the tool room should be in force, otherwise the loss will be quite noticeable. Only a certain kind of tools should be placed in bins on shelves. Those tools which are used most frequently should be hung on large boards so they can be easily found and reached. The mechanic will also be able to notice if the tool is in or not, without having to ask the tool clerk. If the space on the board where such tool belongs is empty he knows that it must be used by someone in his shop. Tool checks should be called in every Saturday in order to determine if any have been lost, so that replacements may be made.

When the repair job is in progress and it becomes necessary to use any parts in order to go ahead with the job, this is called to the attention of the man in charge of the order department. A list is made up of all parts necessary and the requisition should be sent to the parts department. It is a bad practice to write up a number of requisitions, for if it could possibly be arranged, all parts should be requisitioned at once as a great deal of time would be saved by doing so. Nothing is as detrimental to the routing of a job as improper parts service. A capable man who thoroughly understands the ordering of parts and the workings of a card inventory should be in charge of the parts department. The bins containing parts which are most frequently used should be nearest the counter where these parts are delivered. Parts books showing a cut of the part are of great assistance to the shop. A master parts book which shows which parts are interchangeable on the different models of cars is invaluable.

Inspection at Regular Intervals

Both the reputation of the shop and the success of routing the job through depends greatly upon thorough inspections at regular intervals. Each department head should make it a habit of visiting all cars on which his men are working, as many times as possible, instructing them and giving advice as to how each job can be done with the best result. No mechanic should ever leave any operation and start on another before his foreman has examined and O. K.'d the job. So much depends upon this thorough inspection that every service manager should set down rules which are to be followed implicitly, for as soon as laxity is shown in inspection the service station will suffer the consequences.

Intelligent Information

Perhaps by this time the customer feels that he ought to inquire as to how the job is coming along. There may be several reasons for him doing so. He probably left his car with the understanding that the job was to be done on a time and material basis. If he did he has a right to be worried. The selection of the employee who has to furnish this information is of great importance as

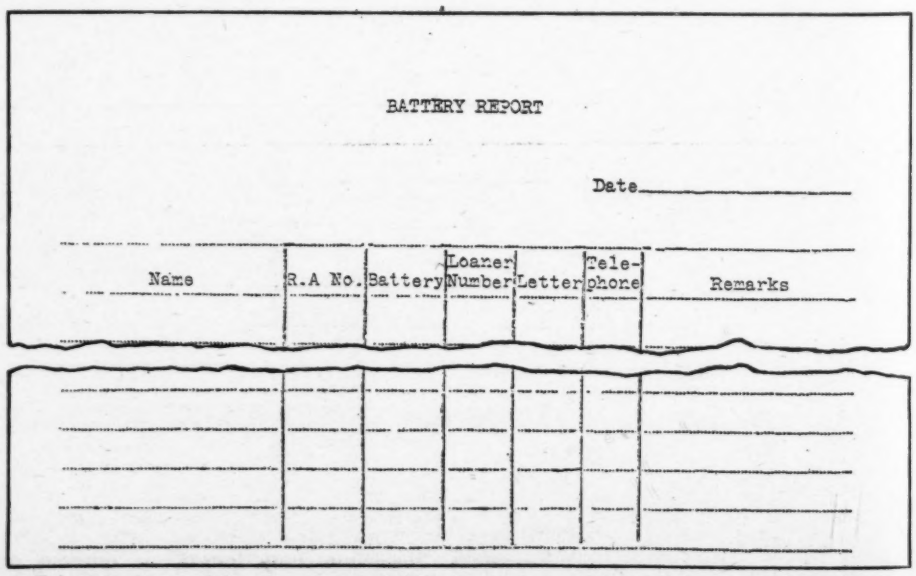


Fig. 14—Loaned battery report which is made out three times a week to keep track of loaned batteries

ESTIMATED JOBS BILLED

R.A. No.	Name	Estimate	Selling Price	Profit	Loss

Fig. 15—Comparison sheet for determining the profit or loss on the jobs as estimated and the actual cost as taken from the shop time record

upon him depends service, if the good will of the customer is to be held. All necessary information should, of course, always be at hand and a good impression created by giving this to the customer in an intelligent manner has a great deal to do in keeping up the good reputation of the company.

The Additional Order

During the course of the work it may be found that some additional repairs will be necessary. The owner should immediately be notified. For, under no condition is it advisable to go ahead without a decision. Every precaution should be taken when writing up the original order, so that the additional orders will be as few as possible, as the owner cannot be blamed for feeling that once his car has been in the service station he has not a chance to get it out without doing what the service department advises him and he feels that most additional orders is just another way of taking from his pockets his hard earned money. Additional work order sheets are on pink paper shown in Fig. 10.

When the job has been completed it should be the duty of each department head to check over every item to make absolutely sure that they have been finished.

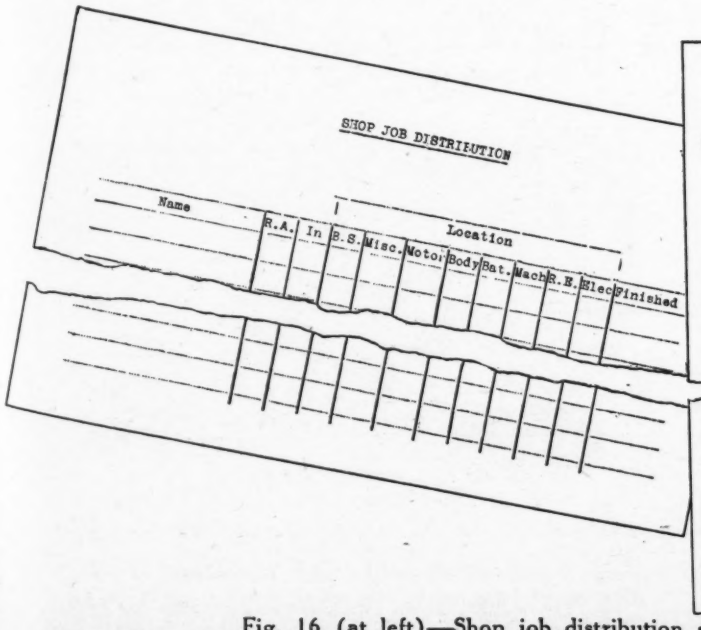
Report should then be made to the shop superintendent that the job is ready for final inspection. A conspicuous colored tag should then be placed on the car so that the final tester will know that the job is being completed. Before the car leaves the shop floor for a test on the road the superintendent or his assistant should go over the job and see that everything has been done according to the original order and the possible additional orders. The form for this is shown in Fig. 8. When this has been done the car may be taken out by the tester.

It is advisable to have a definite testing route outlined. This route should include roads and streets which are in bad condition, in order to bring out any squeaks and rattles of which the customer has previously complained. This road should also include asphalt roads and hills, so both quietness and power may be determined. Another reason for having a definite testing route is that the service department will at all times know approximately where the tester is. In the event that an accident should happen another man can be sent over the road and render possible assistance. As the routing of the job is nearly at an end the closing and billing should be done as quickly as possible in order that those customers who are waiting to take delivery of the cars shall not spend any length of time waiting around the premises, for if a few of the waiting customers come together they may seek each other's sympathy and may be telling things that the service manager would wish each customer to keep to himself.

Personal Interest in Each job.

The car is now to be turned over to the owner. A proper pass should be furnished him so that no delay may be experienced at the door. It is well to remember that although the routing of the job is over, and the owner has taken possession of the car and that he has left the service station he should not be forgotten. To call a customer up a few days after he has taken away his car and ask how it is working sometimes works wonders. He feels that you have taken a real interest in his car, not only for the money that was in the job but for himself personally.

In conclusion I wish to say that if every service manager will take upon himself to apply all or some of the principles which I have just mentioned I can assure him that it will be possible to make service pleasant and profitable.



WILLYS-OVERLAND, INC.

BRANCH

COMPLAINT RECORD

Customer ..... No. .....

Address ..... Model .....

Complaint Received (By Letter / By Telephone / Verbally) By .....

Complaint acknowledged by letter ..... By .....

Subject of Complaint .....

Referred to ..... Date ..... 191..

INFORMATION WANTED	INFORMATION OBTAINED

Decision Reached: Error made by .....

Charge Expense of $..... to .....

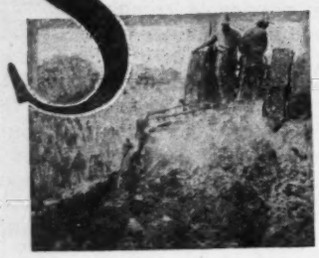
Settled with customer by .....

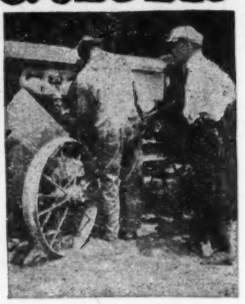
Approved .....

MANAGER'S OFFICE

Fig. 16 (at left)—Shop job distribution sheet to show the progress of the work
Fig. 17 (at right)—Complaint record which gives complete details as to the responsibility for the error and the proper placing of the charges due to the error.

Standard Mechanical Operations in Tractor Service





by John Charles Thorpe, M.E.
and Gustav Howard Radebaugh

EDITOR'S NOTE: In last week's issue of MOTOR AGE we told how to locate a spark plug that is not firing when the engine is running and how to gage the proper distance between the firing points. The two pages herewith are the fourth of a series covering the service operations on tractors, although the same can be applied quite generally to passenger car and truck engines. This installment also deals with the subject of spark plugs, the illustrations showing the procedures necessary to secure to correct operation of a faulty plug which has ceased to function properly because of carbon or oil deposits on the plug; broken or cracked insulator, burned or corroded firing points. The operations are carried out in the order in which the illustrations are numbered.

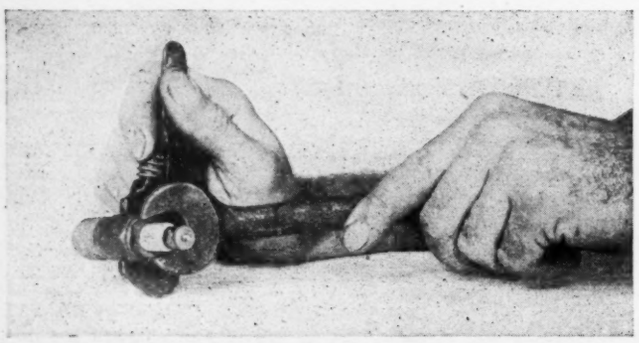
Ignition Troubles Caused by Faulty Spark Plug

One of the most common causes of interruption in tractor operation is found in faulty spark plugs. These faults may be classified as follows:

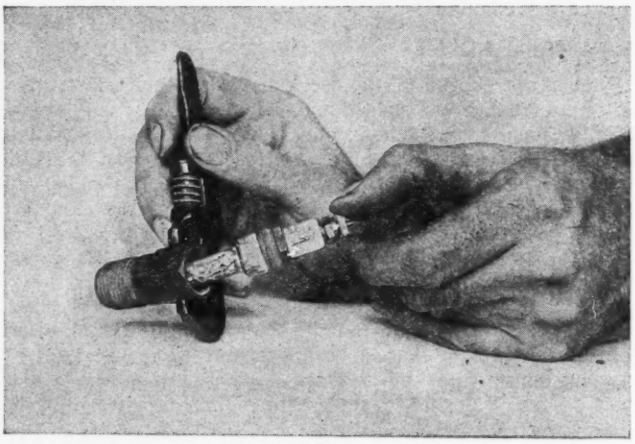
1. Improper gauge of firing points.
2. Broken or cracked porcelain or insulator.
3. Carbon or oil deposits on the plugs.
4. Burned or corroded firing points.

The following nine illustrations show the procedure in disassembling a spark plug, inspecting and cleaning the porcelain, cleaning the firing points and gaging the proper distance between the firing points.

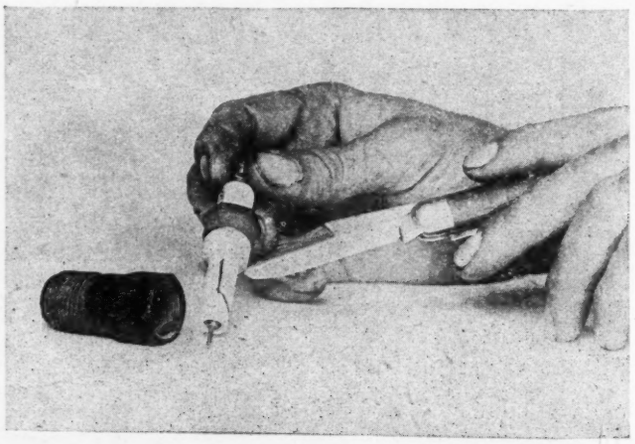
Next week's installment of this interesting and valuable series will deal with troubles of the ignition cables. A faulty ignition cable is often the mysterious cause of missing in the engine; an oil-soaked or abraded wire touching some metal part and causing short-circuit of the wiring system. Tracing and correcting these troubles will be simple if advantage is taken of the methods presented next week.



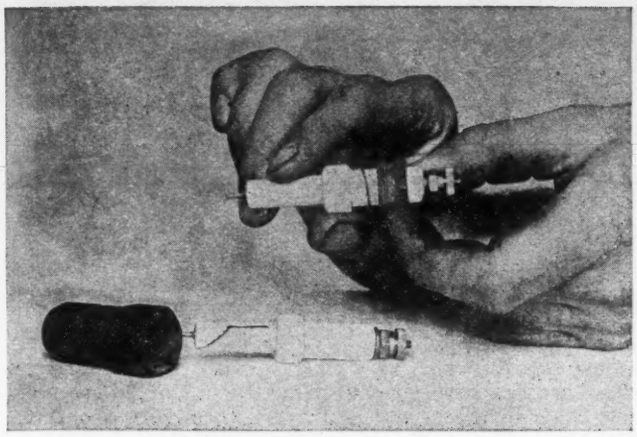
1. Hold body of plug firmly in one hand with one wrench and unscrew bushing holding porcelain from the body of the plug by using another small wrench provided for the purpose in the tool kit



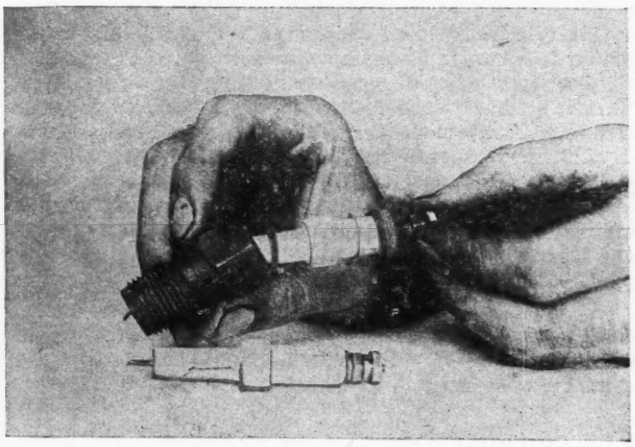
2. Remove porcelain from bushing. Porcelain will be found covered with soft carbon and oil. This may be due to an excess or poor quality of oil, or to a poor carbureter adjustment



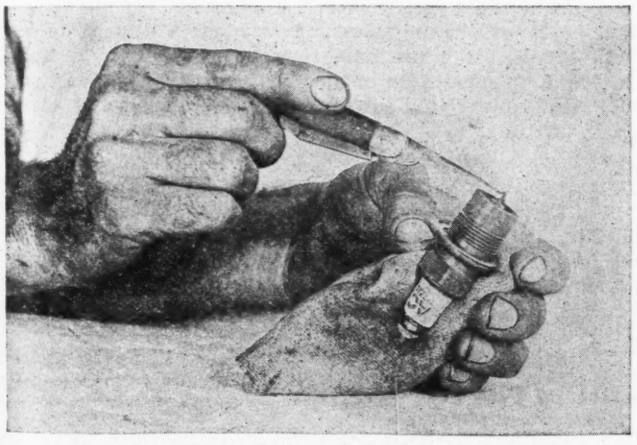
3. Thoroughly clean porcelain and inspect for cracks. In many instances the porcelain will be found discolored by heat and the cracks may be so fine as to require the most careful inspection to find them



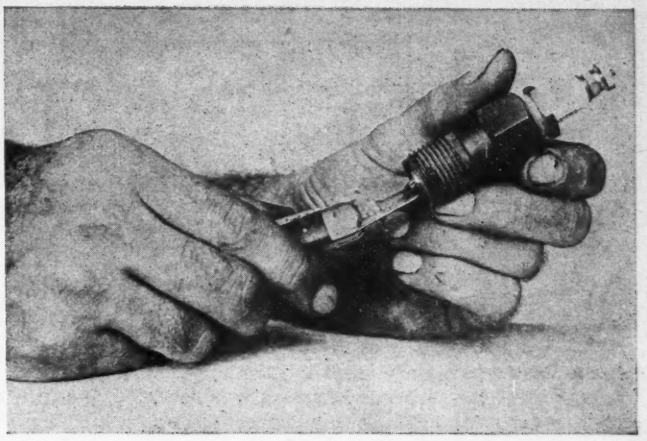
4. Secure new porcelain, insert in bushing, and replace in spark plug body. New porcelains are often damaged in handling or packing. It is thus important that they be inspected carefully before making replacement



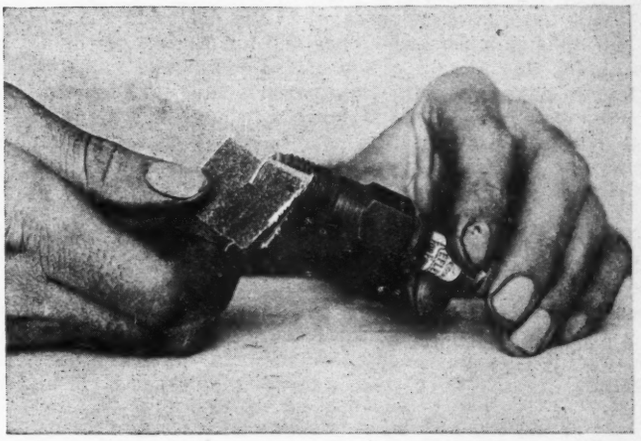
5. Be careful to see that gasket provided for making gas tight joint between bushing and body of plug is properly in place



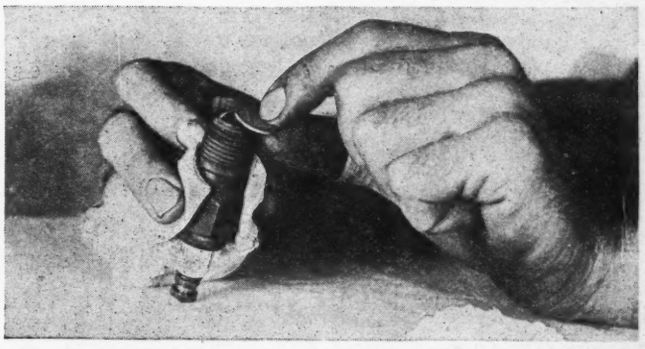
6. When a plug is found to be covered with oil and filled with a deposit of soft carbon, this condition usually arises from an excess of oil or the use of a poor quality of lubricant. It may also arise from a poor carbureter adjustment



7. Scrape out carbon by using small blade of pocket knife. Be careful not to injure the electrodes or disturb the proper gage of the plug



8. Firing points may also be cleaned well by using strip of emery cloth. This may be considered a more satisfactory plan than using a knife blade, but the emery cloth is not so often at hand



9. Test spark plug points with a worn dime. It would be found, by accurate measurement, that such a coin, having been in circulation for a few years, will have worn down to practically the exact thickness of .025 in.

YOU see in pictures on these two pages mechanical operations often referred to in discussions about spark plugs. You have been told to do this or that, but have not been shown how. By following this series you will have unfolded before you a motion-picture method of performing service operations on tractors, trucks, motor car or any automotive products.

Next week we shall describe the troubles of ignition cables. Short-circuiting caused by oil soaked or abraded cables.

EDITORIAL

What the Vision of Power Farming Means

IN the days when we viewed the tractor business through the eyeglass of the future, a business was revealed, the future of which as far as the dealer was concerned, was a bit hazy. The future that was viewed through the eyeglass of the future magnified a certain period of the industry, which we have now reached. And when we face the array of figures that are presented by the farm power industry, which in former times was called the tractor industry, we cannot help but gasp and wonder.

THE time has now come when the dealer in the motor car industry must decide once and for all whether or not he is to enter this newer portion of the automotive industry. If he decides not to enter the farm power business he must remain a motor car and truck dealer exclusively. But if he enters into this other phase of the business, the business of supplying power farm machinery to the farm, the dealer automatically becomes an implement dealer in the full sense of the word.

A TRACTOR of itself means nothing! The business end of the tractor is the plow. And of necessity therefore the dealer must handle plows. He must also handle threshing machines, binders, cultivators, and manure spreaders, because it is with these tools that the tractor is enabled to perform its work. It does not seem reasonable, to ask the farmer, after selling him a forlorn tractor to go some other place and pick up a plow or a harrow. Very likely he will have trouble in securing the exact sized machinery for the tractor he has been sold. So, it is to the benefit of the dealers, those who enter into this farm power industry, to sell the full line.

THEN along with the idea of motorizing the farm, comes the question of farm lights. The electric farm light is a logical development. It rounds out the line of farm power equipment. But with it, we face the same problem as with the tractor.

THE farm light of itself means nothing! Therefore, this dealer in motorized farm equipment must of necessity handle the accessories that naturally follow the farm light. The farmer's house must be wired, light fixtures must be installed, and conveniences for the home naturally follow. Power appliances must be supplied. The electricity might as well be used once it is installed. The grindstone should be turned, the cows should be milked with the patented electric milking machines, and the family washing might just as well be done with this twentieth century slave.

THIS is the vision that was revealed some years ago. The time foretold has arrived. Tractors and farm lights only make the necessary introduction to this business. The follow-up methods used by the dealer determine the rest.

Getting Ready for the Summer Load

HAVE you thought about that new coat of paint for the woodwork in the parts department? Or that new sign you were going to put out over your place of business last year? In short, are you ready to put up a good appearance when the big rush of business starts this year?

DO you realize that customers are impressed with your methods for seeking a continuance of their patronage? It makes a vast difference if they drive into your service station and see in place of last year's weather-beaten and dirty door a newly painted one. Or, a floor that has been scrubbed clean with a lye solution.

IT does not necessarily take a great amount of capital to give the service station a new aspect. Don't let your customers think that you are going on doing business in the same old way year after year. Sometimes just a little rearrangement of the parts shelves, the addition of a showcase, a basket of flowers in the salesroom window, a cement driveway and other things too numerous to mention go a long way to build up good will in your community. In addition, transient trade invariably selects the service station or shop that looks inviting.

THOSE of us who have had occasion to seek a service station in a strange town nine times out of ten pick the place that looks good to us. So, be sure that your place is the one to look good to tourists, besides your regular customers. Outward appearance counts for very much, but be sure to follow it up on the inside. The time to start cleaning house is now.

The Passing of the National Tractor Show

INFORMATION from reliable sources has reached MOTOR AGE that last week's exhibition at Kansas City is the last one which will be tagged as a National Tractor show. Next year several shows will be held. These will probably be one in the East, probably in central New York, another probably in Chicago, another in Kansas City, another in the Pacific Coast territory and still others in the Northwest, South and Southwest. But none of them will carry the label "National."

THIS is a recognition by manufacturers of the fact that various types of tractors are called for in various parts of the United States. It is an admission that there is no such thing as the "universal" tractor. Soil and other conditions in California, for instance, call for a radically different type of tractor than those in Kansas.

THE California dealer is not interested in the machines which will appeal to the man from Kansas and the Kansas man doesn't care about tractors designed for New England conditions.

"NATIONAL" shows, as applied to the tractors must mean shows which exhibit machines suited to all parts of the nation. And manifestly it would be impossible to display models of all machines suited for the widely diverging purposes of the United States in any one show. Sectional shows are the only answer to the problem.

EXPOSE BIG SPARK PLUG SWINDLE

Arrests in Chicago Uncover $1,000,000 Imitation of Champion Company's Product

CHICAGO, Feb. 20—Exposure of a gigantic plot whereby the Champion Spark Plug Co. of Toledo and its customers have been defrauded out of at least $1,000,000, and the company itself has suffered inestimable damage in its reputation, was made here this week. While it is impossible to tell as yet just how much damage was lost in the swindle, $1,000,000 is believed to be a conservative estimate.

Exposure came after the company had expended more than $50,000 in tracing down spurious plugs made in imitation of its product, which were flooding the market. Several men implicated in the plot have been arrested and will be hailed into the Federal courts, where it is said their revelations will implicate several wealthy Chicago men in the swindle. The case is now on the docket of Judge Landis' court and it is expected will be called within a few days.

The procedure of the swindlers was simple. They manufactured, or assembled, a spark plug made in close imitation of the appearance of the Champion plug. This plug was made of inferior materials, which enabled the swindlers to undersell the regular salesmen and jobbers for the Champion company and the imitation was so clever that it is said that even agents of the Champion company were sometimes deceived.

Thousands of the spurious plugs were sold to dealers by agents of the swindlers, who had little difficulty in disposing of their wares because they were able to offer the plugs at a lower price than the accredited agents of the company. Indeed, so cleverly were the sales handled, that agents of the Champion company were often accused of profiteering when they tried to sell their goods at the regular factory price.

This aroused the suspicions of the company which immediately set detectives to run down the spurious plugs. It was discovered that the imitations had been so cleverly made that in some instances the spurious plugs were sent back to the Champion factory as being defective and were replaced with new, genuine plugs. The spurious plugs have been on the market for nearly four years.

William A. Bentley is the only man who has been arrested for the swindle so far, but he is believed to be only a minor employe of the swindlers. He has named several other men to Federal investigators but these names have not been revealed pending further arrests.

COLUMBUS CLUBS COMBINE

Columbus, Ohio, Feb. 20—The consolidation of the Columbus Automobile Club and the Capital Motor Club of Columbus was effected Feb. 13 after several months of negotiations and now the Buckeye Capital has but one automobile club. Motorists belonging to the clubs and especially those belonging to both clubs have been favorable to a merging of the two organizations for some time. When Charles C. Janes was elected president of the Columbus Automobile Club last December he named a committee to negotiate with the Capital Motor Club and a like committee was named by M. J. Hanly, president of the latter organization. All members of the Capital Motor Club become members of the Columbus Automobile club and the rooms are to be located in the Southern Hotel. The club rooms of the Capital Motor Club in the Virginia Hotel will be closed. The merged organizations consist of 4500 members. Many projects for the benefit of motorists in central Ohio will be undertaken.

SAN FRANCISCO GETS AIR SHOW

San Francisco, Feb. 23—The first national aeronautical exposition to be held on the Pacific Coast will open at the Exposition Auditorium, San Francisco, the week of April 21 to 28. It is one of three national expositions of commercial aircraft to be held in the United States. The aircraft and accessories shown in Chicago in January, and in New York in March will be supplemented by the craft which could not be assembled in time for the other expositions. Exhibits at the New York show will be shipped to San Francisco.

The San Francisco show has the sanction, approval and patronage of the Manufacturers' Aircraft Association. Show headquarters until March 20 will be Suite 1905, 501 Fifth avenue, New York. After that date they will be at the Hotel St. Francis, San Francisco.

LOS ANGELES RACE TWICE POSTPONED

Rain Forces Promoters to Switch Big Event to Feb. 28—Records Are Expected

LOS Angeles, Feb. 22—Continued wet weather forced two postponements in the Washington's Birthday race which was scheduled to open the new Beverly Hills track here. The race, originally scheduled for Feb. 21 was postponed to Feb. 23 on account of bad weather, and when the rain showed no signs of abating this evening, a further postponement was made to Saturday, Feb. 28. All cars at the track are expected to remain here for the later date.

Everything is in readiness for the big race and it is confidently expected that new records will be made. Drivers who have competed on the fastest tracks in the United States, notable those at Cincinnati and the old ones at New York and Chicago declare the Los Angeles boardway is far the fastest of any track they have driven over. They declare that new records are a certainty.

CEDAR RAPIDS HAS GOOD SHOW

Dealers Report Excellent Results From a Business Standpoint—Dinner is Feature

CEDAR RAPIDS, Ia., Feb. 23—The annual Cedar Rapids motor show was held Feb. 11 to 14 under the auspices of the Linn County Motor Trades Bureau. The show was held in the Auditorium where a floor space of 140 by 100 ft. was available on the first floor and a similar space in the basement. The passenger cars were shown on the first floor and the trucks, tractors and farm lighting systems in the basement. There were thirty-nine exhibitors and a total of sixty-eight passenger cars.

While the auditorium is not the best place in the world for a car show the decorations were of such a nature as to give a very pleasing effect. A combination of the Italian garden effect and an oriental design featured the decorations and the result was entirely satisfactory from a decorative standpoint.

Dealers at the show, especially the Cedar Rapids dealers, report excellent results from a business standpoint. Almost everybody in Iowa has money now and the dealers are going to have no trouble in selling all the cars they can get. Deliveries are the big problem of the trade.

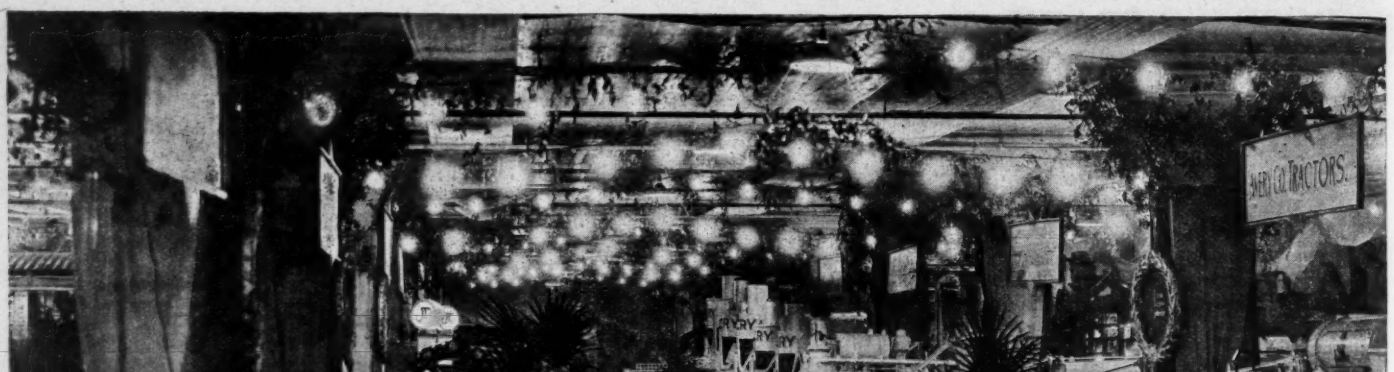
The big feature of the show was the dinner given on Wednesday night by the Linn County Motor Trades Bureau to the visiting dealers. Covers were laid for 225 dealers. F. E. McClure, manager of the Des Moines branch of the Ford Motor Co. was the principal speaker of the evening. Mr. McClure took better business methods for the dealers as his subject and laid much stress on the value of cleanliness and order in the salesrooms and service stations of the present day dealers. A. J. Knapp, secretary of the Iowa motor trades bureau also had a place on the program and talked to the dealers on the part which his organization could take in the general welfare of the trade.

ALABAMA VOTES ROAD BONDS

Atlanta, Ga., Feb. 23—Alabama has overwhelmingly voted in favor of a $25,000,000 bond issue for the improvement and construction of good roads. Early reports indicate that the issue carried by a 10 to 1 majority.

The state in this action qualified for a like amount from the federal government for highway construction. Machinery for the disposition of the bonds and the expenditure of the $50,000,000 has been provided by legislation.

State Highway Engineer W. S. Keller said that a complete survey of the state by road engineers would begin as soon as the first bonds are sold, which will be some time in the late spring or early summer.



General view of one of the aisles at the Fifth National Tractor Show held at Kansas City

Real Progress in Power Farming at Kansas City Show

Big Crowds at Exhibit are Evidence of the Lively Interest Farmers are Taking in Development of Tractors

KANSAS CITY, Mo., Feb. 18—"Tickle the soil and it laughs a harvest," says one of the Traxiums which appear as a distinctive feature of the decorative scheme at the Fifth National Tractor Show being held here this week.

Traxiums

Buy a Tractor Today for Tomorrow Your Horse May Die
Own Your Own Grain Separator
Raise More Food with Tractors
Power Implements Last Longer
Horses Cannot Stand Hot Weather
Remember—Your Radiator Is Not a Camel
The Tractor and Your Boy Will Be Pals
No Tractor Is Better than the Implement It Pulls
A Rolling Tractor Gathers Profits

The variety of ways and the thoroughness with which that tickling can be done are being completely demonstrated.

That the tractor industry is full-grown and able to hold its own against all its automotive competitors as the basis of a big, overpowering, bewildering show, is being shown conclusively.

That power farming has its devotees, as earnest and as enthusiastic as motordom even, is proven by the fact that thousands of men, manufacturers, engineers, dealers and farmers from all sections of the county are flocking to Kansas City this week to see a show which is almost exclusively tractor power farming equipment.

In magnitude and attractiveness, and certainly in variety of interest, the National Tractor Show compares favorably, if it does not surpass, a motor car show.

This year there are a score more than 200 individual exhibits, 70 of them being displays of distinct makes of tractors. The remaining 150 exhibits, with the exception of about ten farm lighting plants and about a dozen publications, are all tractor also in the sense that they are either of special tractor parts or accessories or of power farm operative equipment, all of which has been especially designed to use with the tractor.

There is not the slightest suggestion of the horse. Always at previous shows there have been a few hang-overs from the old days, but this year Dobbin is totally ignored. This is a power farm show and that exclusively.

Production and distribution seem to be the factors which determine perpetuity in the tractor business, if one is permitted to judge by comparing the present show with that which was held last year.

There were tractors shown last year which excited the admiration and approval of engineers because of their design and construction. Superficially there was no reason why these models should not have attained popularity and have taken their place among the machines which have been tickling the soil during the last year.

Practically none of these machines are shown this year. They have neither been anything of a factor during the year that has gone, nor do they give promise of being anything of a factor in the future. Their place, however, has been taken by a new crop of tractors—most of them of the assembled variety. Will these too disappear during the coming year leaving the field to the old familiars who have been in the business practically from the beginning of the modern tractor business, who were here last year, who are here this year and which promise to be here next year—and with every little change either in design or construction from what they were two years ago?

The fact seems to be, if one may judge by the show, that the most important

thing in keeping a tractor alive and in the public confidence is to produce it in quantity and then have the right kind of a sales organization to put it across. This may not sound orthodox to engineers, but it seems to be the explanation of why some of the tractors which certainly are not completely up to date from an engineering view point continue to be popular.

This being the case one wonders if ever there will be a National Tractor Show which will exceed this one in size and variety. It is doubtful. There are 70 makes of tractors on exhibition here this week. The best available figures indicate there will be about that many producing companies during 1920. That there will be some elimination, some substitution—that as time goes on some of the tractors which apparently enjoy considerable popularity now may be displaced by others which now are relatively obscure, is to be expected. It will hardly augur well for the tractor industry if some of the better engineered and more modern designs do not displace some of the old timers—in time—but before they succeed in doing it they must get a selling organization which can take care of a reasonable production. That, as the writers see it, is the lesson of this year's show, when compared with what is remembered of last year's show.

The Oliver Chilled Plow Works had a reception space done in exceptionally good taste

Many Types of Tractors Needed

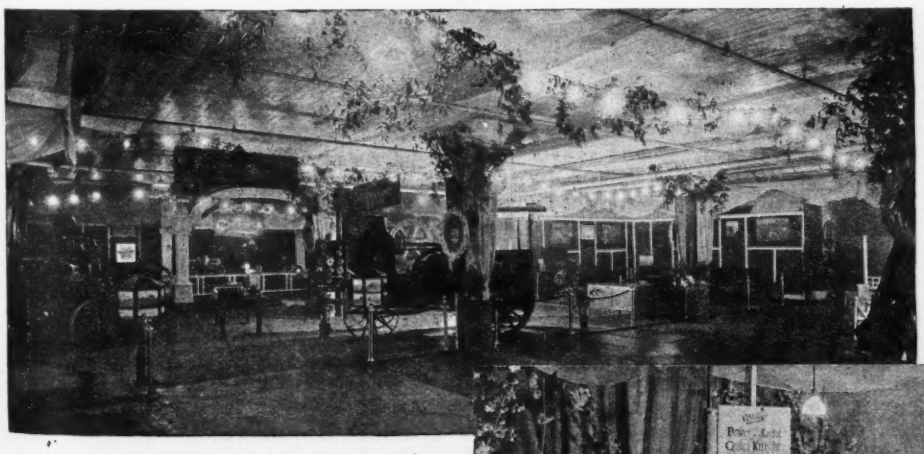
There are three things about this show which particularly impress the writer.

First: There is a final quietus put upon the idea that there ever can be a standard, uniform design, or a common rating, that will satisfy the multifarious needs of the farmer. Almost every possible rating, from the little garden tractor small enough to be used as a watch charm by a real husky man, to the big machine which delivers 60 hp. on the drawbar, seems to have a model to define it. During the last year a number of concerns have interpolated tractors into their lines, filling up gaps which existed, and now there are machines which will give the farmer almost any combination of horse power rating he wants on drawbar and belt. Nor is it likely that the number of these ratings will be decreased. With the increase in the variety of uses which has been found for the tractor there is growing need for all of these ratings and they may be expected to persist This kills for all time the notion of a standardized type and rating for a universal machine.

Second: There is the conviction that tractor design is becoming standardized along two well defined lines. There is a persistance of the old horizontal cylinder type of engine and there is the automobile type of vertical cylinder engine. These two types are developing side by side and give promise of being permanent. For this reason the writer thinks this year's show settles the matter as to the survival of engine type—both types will survive.

Develop General Purpose Tractor

Third: There has been marked development along the lines of the general purpose tractor and the motor cultivator. There is a big field for both of these kindred machines, because they will cultivate. In addition the motor cultivator is a machine versatile in application to other 2-horse tasks on the farm and it is destined to go a long way. The general purpose tractor and the motor cultivator will combine to displace more horses on the farms of this country than the standard types of tractors ever can displace. And what horses these machines leave the motor truck and the garden tractor will get. The horseless farm has been more or less of a dream up to this time, but now it is here. The horse is doomed, if the lessons of this year's tractor show are not deceiving.



Upper left—General view of the Advance-Rumely exhibit. Lower right—K.-C. Willys Light Co. display

Sweden Finds American Tractors to Its Liking

WASHINGTON, Feb. 21—A large demand for American tractors is reported from Sweden by Consul W. H. Sholes to the Bureau of Foreign and Domestic Commerce. Sweden's four factories, with an estimated annual output of 400, are entirely unable to meet the demand in that country.

Owing to the absence of horses and the labor shortage, the employment of modern agricultural machinery is making considerable headway in the country, and the Swedish farmer, having accumulated much money during the war, has suddenly become a great purchasing power in the markets of the world.

The national wealth of Sweden in 1908 was $4,080,000,000, of which 25.8 per cent was in landed property, including live stock and equipment. Today it probably is more than $6,000,000,000.

The farms of Sweden consist mostly of small holdings. In 1910 about 48.23 per cent of the country was devoted to farming, as compared with 60.92 per cent in 1890. The loss was largely due to the emigration to the United States. Only 10 per cent of the farms are above 100 acres. Of these about 45 per cent are owned and about 55 per cent are rented. There are about 8,000 to 10,000 farms in the Goteborg consular district.

Plowing is done during the autumn, and the tractor is coming into considerable use for this purpose. The high price of horses (approximately $804 per head), and of manual labor ($2.15 per day), will doubtless force the conservative Swedish farmer to adopt labor-saving machinery throughout.

PENNSYLVANIA PLANS NEW ROADS

Philadelphia, Feb. 20—Pennsylvania, which led the nation in road-building in 1919, will open bids in the Highway Department on April 1, for 800 additional miles of roadway. It is estimated that 1300 miles of new roads in the State will be under construction by July 1 next. Reports of the State Highway Department show that 253.10 miles of durable highways and 41.58 miles of uncovered base were constructed in Pennsylvania last year. Contractors were held up on many days because of inclement weather.

A total of 3,316,306 feet of roadway is involved in the contracts awarded in 1919. The highway department last year contracted for 685.02 miles of durable roadway of many types. During 1919 a total of 73.36 miles of uncompleted mileage from 1918 was finished. Of the 685.02 miles contracted for last year, 179.74 miles was entirely completed when the contractors shut down for the winter. This year the contractors will start work on 527.39 miles of contracts remaining from 1918 and 1919 .

TO ESTABLISH EQUIPMENT STORE CHAIN

Chicago, Feb. 20—Invasion of the automotive accessory field is planned by the Winchester Arms Co., which plans to establish a chain of retail automobile equipment stores in various parts of the United States. The company, however, has informed the Automotive Equipment association headquarters here that it has no intention of entering the jobbing field in this line.

ST. PAUL CLUB IN NEW QUARTERS

St. Paul, Feb. 21—Clubrooms of the Automobile Club of St. Paul have been changed from the St. Paul hotel, where they have been, to new and more commodious quarters in the Ryan hotel. The Ryan hotel is one of the oldest and best known hotels in the city and much more spacious quarters are available than in the old location.

Plans are being made by the St. Paul club to render every possible assistance to tourists who contemplate visiting the northwest this year. An information bureau has been established at the new club rooms, where detailed information regarding roads, free routes and free road maps will be furnished tourists. The club also will make room reservations for tourists provided sufficient notification is given.

PHILADELPHIA SERVICE STATIONS MOVED

Philadelphia, Feb. 20—The service department of the Motor Parts Co. is removing from its location at 847 North Broad Street, to the service building, just completed, at 1425 North Broad Street. The new structure is especially designed on its interior for sales and service on Bosch magnetos, Zenith carbureters and Columbia storage batteries and will be devoted to the needs of local trade. The service department will operate under the name of "Motor Parts Service."

CANADIAN TRACTOR INVADES U. S.

Buffalo, Feb. 20—The Siemon Tractor Co., a Canadian Corporation, will establish an American branch in Buffalo. The firm has taken a long lease on the old Gary safe plant here and will soon begin operation. The firm will occupy the entire 60,000 sq. ft, of floor space, the building having its own switching tracks.

The Canadian firm already has plants in Toronto and New Hamburg, Ont. Expanding business in the United States is given as the firm's reason for establishment of an American plant.

Ask Federal Registration to Eliminate Motor Car Thefts

WASHINGTON, Feb. 20—The establishment of a Federal Registration Bureau in the Department of Justice with registrars in each State to certify transfers of passenger cars, trucks, airplanes and motorcycles and prevent the theft of motor vehicles, would be provided by a bill introduced by Congressman Harreld this week in the House of Representatives.

The bill would establish a Bureau with a sum of $50,000, and would give it authority over automobiles, automobile trucks, automobile wagons, motorcycles, motor boats, airplanes or any self propelled vehicles not designed for running on rails. The registrars in each State would be appointed by the Attorney General, and would receive applications for and issue certificates of ownership describing the motor vehicles as sold within each State. They would issue new certificates of ownership when the vehicles would be resold. The owner of the vehicle transferring it by sale or otherwise, would be obliged to use a duplicate bill of sale, describing the vehicles sold, giving the engine number, the car number and other distinguishing marks, the duplicate being mailed promptly to the Federal Motor Registrar in the State. Upon receiving copy of the bill of sale, the registrar would issue a certificate of ownership to the Bureau.

This bill would not apply to sales made by manufacturers of motor vehicles to dealers when they are purchased for the purpose of resale to the consumer. The registrar would collect $2.00 from the person selling the car or from the person buying it as compensation for the issuance of certificate of ownership. The $2.00 fee would be the pay the registrar would receive for his service. A clause provides that if the fees are more than $3000 for the calendar year, the surplus would be paid into the Treasury of the United States. In such event, States such as New York would be paying into the treasury of the United States the sum of $190,000, if the sales continue in proportion to those of 1919, this estimate being based on new car sales only.

FIGHT AGAINST DAMAGE TO CARS IN TRANSIT

Des Moines, Iowa, Feb. 20—At a recent meeting of the directors of the Iowa Motor Trades Bureau action was started which it is thought may help solve the question of damage to motor cars in transit. For a long time Iowa dealers have been having a great deal of trouble in receiving their cars intact. Hoboes and vandals have sought the

soft cushions of the cars in transit as a comfortable place in which to locate while beating a ride. In some cases the damage has been slight but there have been frequent cases where different parts were stolen, and occasionally even tires and rims. As one means of fighting this evil directors of the trade suggest that cars should not be shipped in freight cars marked with the word automobile. They have made this suggestion to the U. S. Railroad administration, the traffic managers of a number of middle west railroads and also to the National Chamber of Commerce.

ST. LOUIS TO BUILD FORDSONS

St. Louis, Feb. 20—Production of Fordson tractors will begin in St. Louis within the next few days, this being the first city which will build tractors in assembling plants formerly used for Fords. Claiborne Williams, manager of the St. Louis branch of the Ford Motor Co., said that within 30 days the daily output of the plant would be 100 tractors a day.

ESTABLISH NEW REPAIR FIRM

Caldwell, Idaho, Feb. 20—Ward Daggett and Clyde Wooley have purchased the Canyon Auto Co., and henceforth will conduct a general repair and service business under the name of Daggett & Wooley. Besides the repair and service work, they handle a full line of accessories, gasoline, oil, etc.

Chevrolet Aids America's Chances at Indianapolis

INDIANAPOLIS, Feb. 22—Louis Chevrolet, intrepid veteran of innumerable speed battles and master designer of racing cars, has entered three Frontenac fliers for the Eighth Annual International 500-mile Sweepstakes on the Indianapolis Motor Speedway, May 31, raising the total number of cars already nominated for the event at this early date to seven.

With his three Frontenacs, Chevrolet will in reality have a representation of six cars in the Indianapolis race, being the designer also of the three Monroe cars previously nominated for the event by William L. Small, wealthy Indianapolis automobile magnate. Both the new Frontenacs and Monroe fliers will be the cynosure of the racing fraternity when they make their first appearance on the track, as the Franco-Swiss designer, when given a free rein, invariably produces results that are sensational and startling.

In the trio of Frontenacs that he campaigned during the last several seasons, he astonished the racing world with their unprecedented lightness, secured through the use of aluminum on a scale that had been regarded as impossible. Chevrolet conclusively demonstrated the soundness of his ideas, however, by sending his fragile creations through a succession of the most gruelling contests in history, and winning a majority of the events in which they competed.

On the point system of scoring, the Frontenac team easily outdistanced all competitors in 1919, with a total of 15,680 points as against 12,820 for its nearest rival, and in the field of track events it took the last ten contests of the season with but a single miss, when Ralph DePalma broke through for a win at Sheepshead Bay.

CUT DOWN DEALERS' TERRITORY

Hartford, Conn., Feb. 21—A number of Hartford dealers do not feel quite as cheerful as they did around show time for the very good reason that their territory has been cut down. Just now when there is so much snow on the ground that running cars is a practice to be vigorously discouraged, the slicing of the territory is almost akin to putting that proverbial last straw on the camel's back. The situation is the more discouraging for those dealers who sell under New York rather than the factories.

NEW STANDARD DISTRIBUTOR IN CHICAGO

Chicago, Feb. 22—Standard trucks are now being distributed in this territory by the Standard Truck Sales Co. of Chicago. H. W. Hoppe and W. J. Dietrich are connected with this company as dealers.

ALLEN STROKE IS 5 IN.

In the issue of January 29, an error was made in stating the bore and stroke of the Allen car was 3½ by 4 in. The bore of the Allen car is 3½ in. and the stroke 5 in.

Two Reports Issued on Aircraft Investigations

WASHINGTON, Feb. 22—Partisan politics are reflected in two reports made by the House committee investigating aircraft expenditures of the United States during the war. The majority report, signed by the two Republican members of the committee, condemns the expenditures and the methods employed in America's aircraft work while the minority report, signed by the one Democratic member, approves.

The majority report declares that despite an expenditure of $1,015,000,000 for aircraft, there were, at the time of the armistice, only 213 American made planes of the De Haviland 4 type and that the entire American air force at that time consisted of only 740 planes, 527 of which were purchased from the Allies. The report charges Secretary of War Baker, John D. Ryan, Maj. Gen. Squier, Col. E. A. Deeds and Col. Disque, who directed the various branches of the work, with the responsibility for the failure.

Exception is taken by the minority report to the majority claim of the small number of planes on the front at the time of the armistice. This document recites that at that time there were 1620 planes available for front line service, 11,760 had actually been produced and a production of 23,000 a year under way. The fact that few planes actually reached the front, states the minority report, is as unjust as judging the Army effort by the fact that there were only 500,000 men actually in line and ignoring the 1,500,000 men behind the lines in France and the 2,000,000 trained men in the United States.

POERTNER HEADS NEW YORK DEALERS

New York, Feb. 21—William C. Poertner, president of the Poertner Motor Car Co., distributor of National and Scripps-Booth cars, has been elected president of the New York Dealers' Association. Mr. Poertner succeeds Charles M. Brown, who has been president for the past three years and under whose administration the New York organization developed to its present position as one of the leaders among the associations in the industry.

Harry J. DeBear, branch manager of the Maxwell Motor Car Co., another of the association's most devoted workers, was given the vice-presidency.

Other officers elected were: Howard R. Bliss, vice-president and general manager of the Colt-Stratton Co., Dodge Brothers distributor, secretary-treasurer; Albert Hirst, president of Albert Hirst, Inc., Ford dealers, chairman of the membership committee; and Harry J. DeBear, chaiman of the application committee.

TEST PENNSYLVANIA LICENSE LAWS

Philadelphia, Feb. 23—The question of whether the State Highway Commissioner has virtually unlimited discretion in requiring an automobile owner to furnish sworn information as to the detailed description of an automobile sought to be registered is being argued in Dauphin County Court. The leagl question arose in a demurrer filed by the attorney general, to a bill in equity which Paul C. Wolff of Pittsburgh, secretary of the Pennsylvania State Motor Federation, sought to compel Commissioner Sadler, of the State Highway Department, to register an automobile, on an application which did not supply all the information that the commissioner requires about a car. This is a test case. Another test case soon is to be started, questioning the commissioner's right to demand the "family history" of an automobile owner when application is made for a license to drive the car.

NEW ORLEANS TO HAVE TWO SHOWS

Elks to Stage Fashion Display Easter Sunday in Addition to Regular Exhibtion

NEW ORLEANS, La., Feb. 21—New Orleans is to have two automobile shows this spring, one in March and one on Easter Sunday, April 4. The Automobile Dealers' association of New Orleans will hold the first show in the new building of the Crescent City Garage, which covers approximately half a city block, on St. Charles street, in the heart of the business district. The New Orleans Lodge of Elks, No. 30, will hold the second show, which will be a combination of fashions and automobiles, in the Fair Grounds where the stands are large enough to take care of the exhibits if the weather is unpropitious for the open-air exhibition of cars and gowns. Last year the Elks raised $12,000 for charity through this show, and this year they expect to realize at least $10,000 for the same purpose. Albert Kraemer is working under Col. John P. Sullivan, exalted ruler in managing the show.

H. B. Marks, who had charge of the dealers' show in 1919, at which $120,000 worth of cars were sold from the floor, will again manage the dealers' exhibition, and the committee in charge consists of L. C. Glenny, L. R. McMillan, F. J. Weinberger, Hamilton Barton, and L. J. Golding, all prominent automobile dealers of this city, and all of whom worked to make last year's exhibition a success. The following firms will be represented:

Abbott Automobile Co., Allen Sales Co., Automotive Sales Co., Bell & Thomson, Barton Motors Co., Bernstein-Glenny Motors Co., Baptiste-Golding Co., Capital City Auto Co., J. D. Cathey, Inc.; Cucullu Motor Car Co.; Eugene A. Dumas, Inc.; Demack Motors Co., Inc., Fairchild Motor Car Co., King Motor Car Co., Inc.; Gus D. Revol, Joseph Schwartz Co., Inc.; Siegel-Garcia Motors Co., Inc.; Sherrous Motor Co., Turner-Cole Co.; H. A. Testard, United Motor Car Co., and Universal Motor Co.

Approximately 100 cars were shown at last year's exhibit, which was held in the Athenaeum, where some cars were kept out by the difficulties of lifting them to the high floor of the auditorium. This year, however, the entrance will be directly from the street, with a graded rise of not more than one foot, so that it is expected approximately twice this number of cars will be shown.

Efforts are also being made, with excellent prospects of success, to stage simultaneously with the big dealers' show, an exhibition of trucks and tractors, with extra space for the equipment dealers, so as to leave the big show for the passenger cars and speedsters only. A. H. Borden, of the Shuler Shuler Auto Supply Co., Inc., is especially interested in the truck and tractor show, as is also L. C. Glenny, of the Bernstein-Glenny Motors Co., both moving spirits in the main show, so that probably we shall have a truck and tractor exhibit either at the same time as the passenger car show, or immediately thereafter.

First Farm Lighting Show

Bloomington, Ill., recently staged the first successful exhibit of farm lighting equipment in the Central West

FARM LIGHT SHOW IS A BIG SUCCESS

Bloomington, Ill., Holds First Separate Exhibition in the Central West

BLOOMINGTON, Ill., Feb. 23—The first joint exhibit of farm lighting systems yet arranged in central Illinois, took place at the Coliseum in Bloomington Feb. 11 to 14. In addition to the display of farm lighting plants, the electrical contractors of Bloomington, also arranged attractive exhibits. The S. H. Williams & Son Co., distributors of the Alamo farm lighting plant; J. E. Lockwood, distributor of the Lalley farm lighting plant; James Gray; distributor of the Western Electric farm light plant; Arthur L. Parks, distributor of the Delco farm lighting plant; and Trimble & Pollock, distributors of the Genco farm lighting plant, all have attractive exhibits and vie with each other in originality of design and decorations.

The joint exhibit attracted 5000 visitors during the four days of the show and the dealers all feel that the time and money expended, will bring big returns. From the large number of inquiries and increased number of prospects, it is certain that the farmer has "arrived" in Illinois as a consumer of electric light and power.

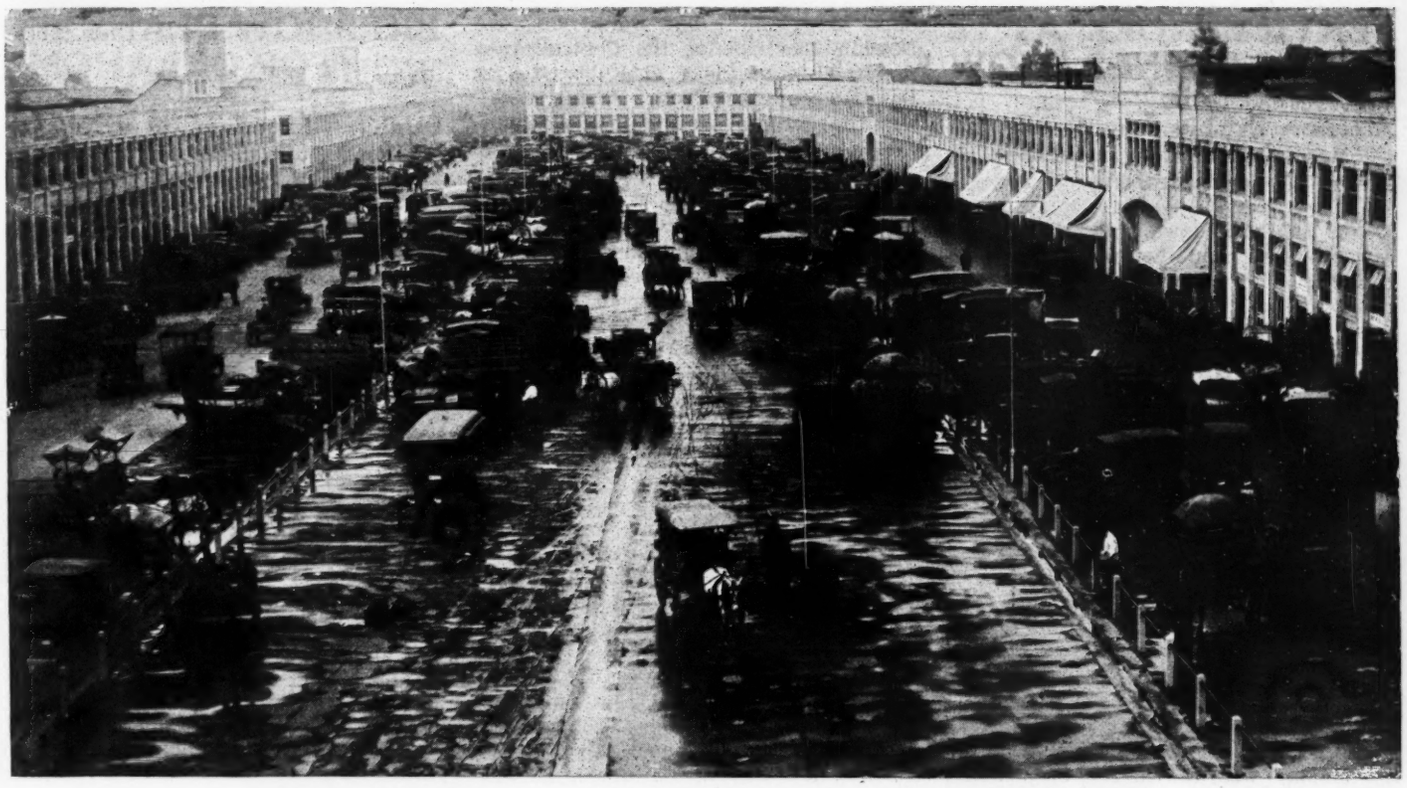
The demand for farm lighting plants is growing so fast that the various distributors are being compelled to expand their business to take care of it. The exceptional prosperity of the farmer since the opening of the war, is at the bottom of the demand for electric service. He wants the same modern conveniences and labor saving service as his city brother and is not averse to paying for it.

This situation makes it easy to sell a farm lighting system and, in a short time, the farm house without electricity in central Illinois will be the exception and not the rule. Following the show at the Coliseum, the Bloomington dealers arranged an intensive sales campaign throughout central Illinois. The first show was so successful that it was determined to stage one next year.

HARRISBURG SCHEDULES ANNUAL SHOW

Harrisburg, Pa., Feb. 23—The annual Harrisburg Motor Show will be held the week of March 27 to April 3, inclusive. This is the decision of the Harrisburg Motor Dealers Association, at a meeting held in the salesrooms of the Overland-Harrisburg Co. No definite location is announced. Officers of the association expect to make this announcement within a few days.

The passenger and truck shows will be held together, instead of there being two separate shows as last year. Only members will be allowed to exhibit. About seventy-five models of automobiles and trucks will be shown, according to present indications. A showing of accessories will be included.



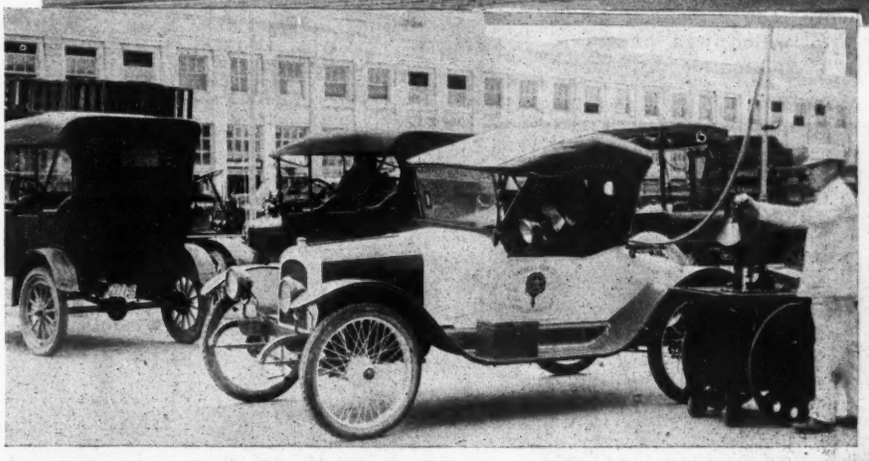
Los Angeles wholesale market, showing the ample provision made for motor trucks bringing in farm and garden produce

How Los Angeles Handles Its Wholesale Produce Market

IN the construction of the Los Angeles wholesale terminal every provision has been made to supply the needs of the hundreds of motor trucks that pass in and out of the market daily. The market has been equipped with a department for vulcanizing tires, also for supplying automobile accessories. An oil service station occupies special quarters at one end of the main building. A specially designed tank was equipped for supplying oil and gasoline to machines parked in the five acre market yard, thus making it unnecessary to go to the station. This tank is wheeled through the yard by an attendant who supplies the trucks with oil and gasoline while they are being loaded or unloaded.

The trucks begin to arrive at the market as early as 3:00 a. m., loaded with produce, and to accommodate these early arrivals the station opens at this early hour. Later in the day great numbers of trucks arrive to deliver the produce to various parts of the city, and thus the business of the oil station continues all day.

Through the advantages offered the farmer at this market, combined with the use of the motor truck in delivering his produce to the market, the farmers within motoring distance of Los Angeles have found an economical and efficient method of disposing of their farm products. The farmer arrives at the market at an early hour and finds hundreds of buyers there ready to inspect his products. Nearly all the fruit and produce dealers occupy space in the market, and when the farmer makes a deal with a buyer, he merely backs his truck up to the building and unloads.



Above—This oil station, which is of special design, occupies part of the new wing of the 1541-ft. market building. It is open for business at 3:00 a. m. to take care of the hundreds of farm trucks which reach the city that early. Below—An attendant supplies automobiles throughout the 5-acre yard with oil and gasoline while the owners of the machines are transacting the business which brought them to the city

SERVICE WORK AT DES MOINES SHOW

Accessory Exhibits Bring Repair and Replacement Equipment Before Dealers

DES MOINES, Iowa, Feb. 21—Service problems and better methods of handling service work came in for special attention in connection with the annual Des Moines Automobile Show last week. Although the show proper was limited to exhibitions of passenger cars and trucks, two separate accessory shows were staged contemporaneously and both these featured the service end of the dealers' business.

The Herring Motor Co. held what proved to be the most elaborate attempt along the service line. The show was held in the company's service room and one entire floor of the building was given over to exhibits of automotive equipment, most of which fell under the classification of service equipment. The space allotted comprised more than 30,000 sq. ft. of floor space which was ample to accommodate 200 booths and the display was the Mecca of dealers throughout the week.

One of the features of the Herring show was a model garage which occupied a prominent position in the display. The garage was equipped with all the latest time and labor saving devices and the many new ideas as to how they can improve upon their own shops were looked upon with much interest. A new radiator repair machine invented by Clyde Shultz of Fort Dodge, Iowa, was one of the most interesting exhibits.

During the show, the Herring Motor Co. organization was guest at a dinner given by the L. H. Gilmer Co., and later in the week the Herring company itself gave a banquet.

Besides the Herring show, there was an independent exhibit of automotive equipment staged in the Des Moines Auditorium by a number of Iowa jobbers of automotive equipment. The firms conducting this show, which was known as the Iowa Automotive Equipment Show were the Hippe States Co., the Downin Electric Co., the Central Auto Supply Co., and the U. S. Rubber Co. of Des Moines; the Cedar Rapids Pump Co., the Schultz Auto Supply Co., and the Sioux City Iron Co. of Sioux City and the Respass Auto Co. of Waterloo.

In its efforts to prepare Iowa dealers for their work for the coming year, the Ford Motor Co. staged a special show, setting up a model salesroom, parts and accessory department and service station for the benefit of visiting dealers. The salesroom and accessory department embodied the ideals toward which the Ford company is striving to educate its dealers and undoubtedly will be of benefit to them.

In the model service room, the Ford company held its second annual mechanical clinic in which various repair operations were discussed and the dealers instructed in the proper methods of making these repairs and replacement at the lowest possible expense to themselves and their customers. The clinic was conducted exclusively by equipment employees of the company and for purposes of demonstration a rear axle transmission was disassembled, an engine was disassembled and reassembled and the maintenance and operation of the new starting and lighting system was thoroughly discussed and explained.

No equipment or accessories were shown at the Des Moines show proper which was limited exclusively to the displays of passenger cars and trucks. The show was held to be highly successful by the dealers both from the standpoint of attendance and sales. The show was held in the Ford Branch plant.

BIG SHOW PLANS FOR OKLAHOMA

Exhibits Valued at in Excess of $500,000 Will Be Displayed at Southwest's Show

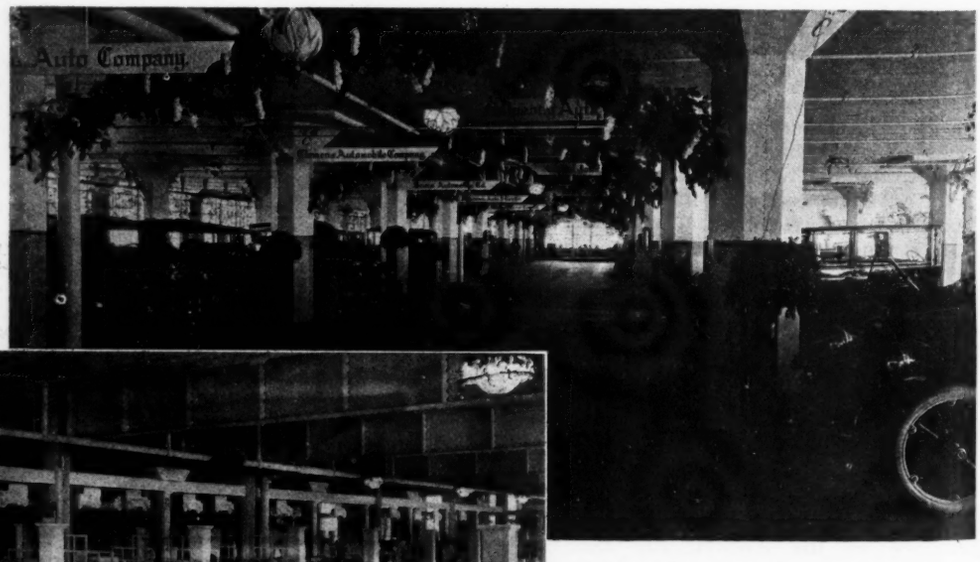
OKLAHOMA CITY, Feb. 20—Exhibits valued at more than $500,000 will be inspected by Oklahoma automobile "prospects" and owners when the Fourth Annual Oklahoma City Automobile show is thrown open to the public on March 22. The show will continue through March 27.

There will be more than ninety automobile exhibitors, and an uncertain number of exhibitors of auto accessories and garage supplies.

The show will be housed in a new Coliseum, built through the joint efforts of the Oklahoma City Motor Car Dealers' Association, who are promoting the show, other Oklahoma City business men, and Wilson & Co., and Morris & Co., packers. The latter contributed $100,000 of the $250,000, the building cost, on the understanding that the Coliseum was to be built near the Oklahoma City stockyards, where it can be used once each year for the annual Southwest American Livestock Show.

Despite the fact that the show last year was the joint exhibit of automobile and truck, and farm power equipment men, the auto and truck exhibitors who are backing the 1920 exhibit are using 10,000 more square feet of floor space than in 1919.

Every prospect is for a tremendous amount of business at the show. The great prosperity of the Southwest has brought a great demand for cars.



Above, the main aisle of the Des Moines Show; below a corner of the Herring service equipment display

GREAT FALLS HAS MONTANA'S SHOW

Exhibit Will Be Display of Cars Best Fitted to West's Peculiar Requirements

GREAT FALLS, Mont., Feb. 20—The Fifth Annual Montana Automobile Show, slated for March 15-20 at Great Falls, will be the only automobile show to be held in Montana this year and one of the few "big-league" shows of the northwest.

The Montana Automobile Distributors' association are sponsoring the 1920 event and have secured the new Studebaker building for the show this year. This will supplant the Palm Room of the Hotel Rainbow which was utilized last year.

Although numerous makes are officially accredited as American cars, Montana dealers handle only about one-third of the total number, as a certain type of car has been found as meeting the requirements of Montana; and many makes which find popular favor in other states have not met the crest of popularity or the trying requirements of some of Montana's famed tourist routes where mountain grades serve as an obstacle to the car which is not a good hill climber.

Figures compiled by Secretary of State, Charles Stewart, show that the 100-mile radius from Great Falls contains more automobiles than any part of the state and for that reason the Great Falls management is citing the claim that the metropolis of northern Montana is the logical place for the state show.

SEATTLE SHOW TO HOUSE TRUCKS

Seattle, Wash., Feb. 23—For the first time trucks and accessories as well as motor cars are in the Annual Show of the Motor Car Dealers Association of Seattle, March 15 to 20, inclusive. The completion of a new downtown automobile building of five stories has made possible the holding of the exposition in a structure ample to house four times as many exhibits as heretofore.

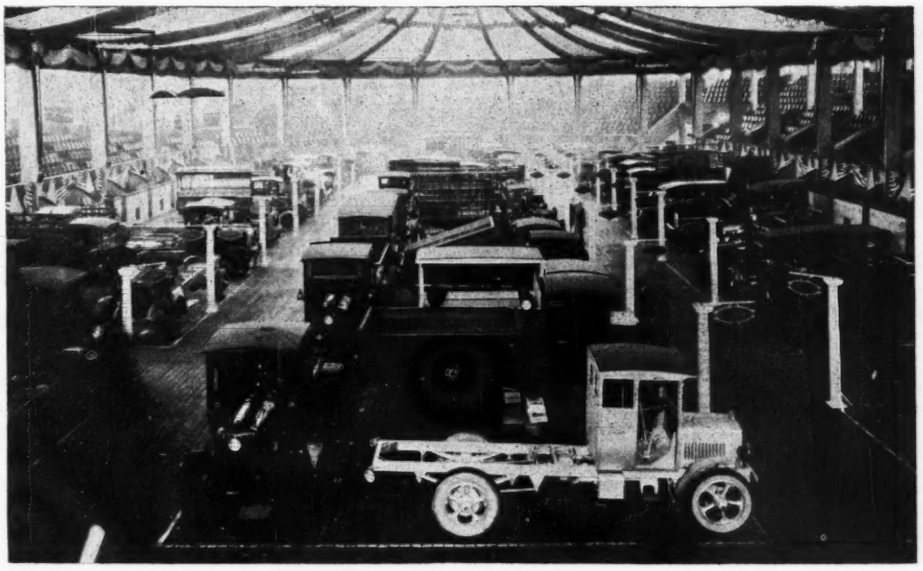
The exposition includes approximately 75,000 sq. ft. The first floor is given over to accessory exhibits, and general offices; the second to trucks; and the third, fourth and fifth to passenger cars. Approximately 150 models of the last-named are being exhibited, and about fifty trucks.

The show is being managed and financed by the dealers themselves. William J. Coyle, managing secretary of the association, is managing the show under direction of the show committee headed by H. P. Grant of the Seattle Automobile Sales Company.

ATLANTA TRACTOR MEN FORM CLUB

Atlanta, Ga., Feb. 23—The Atlanta Tractor and Implement Club was formed here this week by southern representatives of tractor and implement companies which have branch establishments or distributors in this city. W. J. Dabney, of the W. J. Dabney Implement Co., was named chairman of a committee that will effect the permanent organization of the club. Other members were J. B. McCutcheon, of the International Harvester Co.; O .H. Chamberlain, Jr., of the Cleveland Tractor Co.; J. W. Rawlings, of Avery & Son; Lee Worshim, Monarch tractor distributor; David T. Bussey, Fordson tractor distributor; and A. W. Redmond, of the Oliver Chilled Plow Co.

A Corner of the St. Louis Truck Show



The Coliseum gave adequate space for the trucks at St. Louis but the passenger cars were crowded at the Southern Hotel

COAST CLUB MEN CELEBRATE VICTORY

Los Angeles, Feb. 23—Celebrating the closing of a whirlwind drive for new members that has been in progress since last Monday, the Los Angeles Automobile Trade Association held a banquet last evening at the Elks' Club. 365 new members were added as a result of the five days' drive, and it was announced by President George R. Hamilton that at least 100 more would be added within the next week as a result of the drive.

ST. LOUIS EXHIBIT IS OVERCROWDED

Southern Hotel is Too Small Now For Displays or Attendance At Annual Show

ST. LOUIS, Feb. 21—Complete success from both attendance and sales standpoints attended the thirteenth annual Automobile Show which held forth last week at the Southern hotel. In fact, so great was the demand for admission and for exhibition space that the show building proved inadequate to its task and unquestionably some means must be devised to get more space for the exhibits next year.

As at the national shows in New York and Chicago, space limitations in the Southern hotel forced to the separation of the passenger car and truck shows. The trucks were displayed in the Coliseum, more than two miles away from the passenger car show, but to render it easier for visitors to see both shows, promoters of the exhibition had arranged for free transportation between the two.

Exhibitors at the show expressed themselves as well satisfied with the results of the show. Despite the fact that nearly all the distributors in the St. Louis district are booked for all the cars they can possible obtain for two or three months, orders fairly rained upon them while the livest sort of prospect lists were readily obtainable. It was no uncommon thing for a would-be purchaser to deposit a check for the full price of a new car and receive nothing more substantial in return than a receipt for his money and the bare promise that he would get a car "as soon as possible."

Displays at the passenger car show were made up of sixty-two different makes of passenger cars while there were thirty-seven accessory exhibitors and seventy-two accessory displays.

HOLDREGE PLANS A SHOW

Holdrege, Neb., Feb. 20—The fourth annual automobile, truck and tractor show will be held in Holdrege, March 31 to April 4. C. Engstrom of the Engstrom Motors Co., and Ralph Kip of the K. & K. Motor Co., are in charge of the arrangements.

Now It's Something Else Which Interferes With Motor Car Production

DETROIT, Feb. 22—A situation unprecedented in the history of the automotive industry threatens to cut production in the Detroit district to a considerable exent before June. One blow after another has fallen on the automobile makers but the latest, an announcement by the Detroit Edison Co., that it would be obliged to deny power to all industries not absolutely essential unless it is afforded some relief from the present coal shortage, is the proverbial straw which threatens to break the camel's back.

All sorts of measures have been resorted to by the makers to keep up their production schedules. They are getting their raw materials and parts supplies overland by truck trains, and trains going to the various factories so laden are not uncommon now and will be every-day sights before the end of summer. The truck has been the salvation of some of the factories and it is unquestionable that as the result of the improvements which have been made in overland truck train shipments, manufacturers may soon become independent of the railroads.

Can't Get Cars to Dealers

When it comes to delivering the finished cars, however, it is a different thing and the inability of the manufacturers to get rid of cars they have actually made rather than inability to manufacture them may soon become the really potent factor in slowing down production. Roads throughout the United States are in bad condition at present, precluding the possibility of dealers from many sections staging driveaways, although these are being made between Detroit and cities to which the roads are in passable condition.

All manner of expedient is being resorted to by manufacturers to store the cars they have made but which cannot be delivered to distributors on account of the railroad congestion and the impassable roads. Every bit of commercial storage space was, of course, snapped up months ago. One manufacturer has taken over an old hotel, renting the whole building just to get the spacious lobby in which to store machines. Another has rented a former brewery to store cars and it is ludicrous to see cars being stored in the huge vats formerly used to brew beer.

Still another has notified distributors that it is up to them to get their own cars, and as a consequence the Detroit hotels are filled with distributors who are camping out there looking after their interests. These distributors have become regular Sherlock Holmes for spotting empty freight cars and when they spot one in Chicago, Cleveland, Toledo or any other nearby city, they stage a driveaway of sufficient cars to that city to load them for transportation to their final destinations.

TIRE OUTPUT NOW IS 45,600,000

Akron, O., Feb. 21—Statistics compiled by the Chamber of Commerce show the peak demand for tires in the United States will be 80,000,000 a year for passenger cars and motor trucks. The present tire output of the country approximately is 45,600,000. It is estimated at the end of the present year, the annual requirements will be 57,000,000 tires. This estimate is based on figures of automobile manufacturers, indicating an output this year of approximately 1,600,000 cars and between 375,000 and 450,000 trucks.

MOTOR AGE A TEXT BOOK

¶Detroit, Feb. 13.—Class Journal publications long have been acknowledged authorities on matters pertinent to the automotive industry but it remained for the Michigan State Auto School to cap the climax in virtually adopting the specification issue of Motor Age as a text book.

¶At the suggestion of school officials the more than 1,500 students, most of them prospective service men, have entered their orders for Motor Age of Jan. 29. It was pointed out to them by their instructors that the technical and mechanical information contained therein would serve to even better advantage than the regulation text books for study of the practical application of mechanical and engineering knowledge, the many illustrations dealing with technical subjects making is especially attractive.

¶The supply on hand in the Detroit office of the Class Journal Co. quickly was exhausted and a telegraph order was sent to Chicago for an amount sufficient to care for the needs of the school.

¶"Is is by far the best authority we have been able to discover," said Assistant Manager E. W. Beatty.

LOUISIANA WANTS $50,000,000 FOR ROADS

New Orleans, La., Feb. 20—The Louisiana State Highway Department, of which Duncan Buie is chief engineer, is planning to go before the next session of the state assembly, with a well-supported plea for a state bond issue of $50,000,000 for a good-roads system, irrespective of parish lines, or of work already completed, being done, or contemplated by the various parishes.

Other states surrounding Louisiana have introduced measures in their legislatures calling for large sums for improved highways, and, in some cases these bills have been passed. Texas, for example, is out for $100,000,000 for better roads; Arkansas wants $50,000,000 and Alabama $25,000,000, while the Mississippians have just failed to get $25,000,000 from their legislature, but will try it all over again next year. Liquidation of the Louisiana bond issue is proposed by means of an automobile horsepower and gasoline tax, the latter to carry with it an inspection system guaranteeing better gasoline.

CARBURETERS ON FORD CARS

Detroit, Feb. 22—Announcement in December that Holley carbureters were being installed on its cars by the Ford Motor Co., gave rise in some quarters to the impression that the Holley product was being used exclusively. As a matter of fact, Holley and Kingston carbureters are being used in the ration of about 66 and 33 per cent, respectively.

NEW BATTERY SERVICE STATION FOR PADUCAH

Paducah, Ky., Feb. 22—Tire and battery service are to be handled in this territory by a new firm, the Thomas Sales & Service Co., which opened its salesrooms this week. The company plans to have one of the most completely equipped service stations in the southern part of the central west for tire and battery work.

CLUB TO BUILD BIG GARAGE

Cincinnati, O., Feb. 20—A garage with a capacity of 400 cars will be a part of the new seven-story building to be erected in the downtown part of Cincinnati by the Cincinnati Automobile Club as its new quarters. The club has a membership of 5000 automobile owners, but plans to finance the building through a stock company. A dormitory for tourists will be one of the features of the building.

AMAZON TIRE PRICES RAISED

New York, Feb. 19—Increases averaging more than 20 percent on all types of tires are announced by the Amazon Rubber Co. of Akron. The price of tubes remains unchanged.

MANY TRUCKS ON FARMS

Washington, Feb. 20—At least 50,000 farmers in the United States own motor trucks which they use on their farms. This is shown by a preliminary survey of the ownership and use of motor trucks by farmers undertaken by the Office of Farm Management and the Bureau of Crop Estimates of the United States Department of Agriculture. The data secured by this inquiry answer many questions which have been asked repeatedly in recent years regarding the extent to

which motor vehicles are used for farm hauling.

The figures on which totals for the nation and the several states are based were secured from approximately 35,000 selected crop reporters of the Bureau of Crop Estimates. These co-operators were asked to report the names and addresses of farmers they knew who own motor trucks for farm use. Passenger cars and trailers for use with passenger cars were excluded and the reporters were asked not to take account of trucks which are used primarily for general custom hauling, or on regularly established routes.

This survey can scarcely be considered a complete census for it is probable that in some localities the crop reporters were not acquainted with all the truck owners, but it is certain a very large per cent have been listed. It is believed that in no state were less than 75 per cent of the trucks reported. If not complete in every respect the figures show the relative distribution very satisfactorily.

The exact number of motor trucks reported is 49,195, divided among the states as follows: Alabama, 847; Arizona, 95; Arkansas, 721; California, 1019; Colorado, 804; Connecticut, 357; Delaware, 100; Florida, 380; Georgia, 1808; Idaho, 329; Illinois, 2261; Indiana, 1548; Iowa, 2773; Kansas, 1732; Kentucky, 818; Louisiana, 310; Maine, 435; Maryland, 596; Massachusetts, 661; Michigan, 1636; Minnesota, 1255; Mississippi, 957; Missouri, 2065; Montana, 359; Nebraska, 2739; Nevada, 41; New Hampshire, 283; New Jersey, 862; New Mexico, 104; New York, 3171; North Carolina, 1450; North Dakota, 501; Ohio, 2261; Oklahoma, 723; Oregon, 369; Pennsylvania, 2760; Rhode Island, 152; South Carolina, 1190; South Dakota, 1708; Tennessee, 978; Texas, 1168; Utah, 173; Vermont, 282; Virginia, 1128; Washington, 682; West Virginia, 465; Wisconsin, 1465; Wyoming, 174.

ENFORCE CONNECTICUT HEADLIGHT LAWS

Hartford, Conn., Feb. 21—Passenger car and truck owners are coming in for a lot of attention by the commissioner of motor vehicles office especially with regard to headlights. The inspectors of the department take the numbers of cars fitted with lenses other than those on the state approved list, and then the owners are notified that they must make the necessary changes. Certain well known makes of lenses are now taboo and stocks on the shelves of the accessory distributors are useless. The state motor vehicle department is also getting after truck users especially with regard to headlight equipment.

Hartford car owners are rather upset over the action of the trolley company in having those who travel over the trolley course brought to court for alleged obstruction of the cars. While it is true that the trolley company clears its tracks of snow it is also a fact that the snow thus removed is tossed over onto that part of the street used by passenger cars and trucks. Several more cases are pending in court.

Canada's Automotive Business Is Quite a Husky Youngster

TORONTO, Ont., Feb. 22—Canada's automotive industry has grown to quite a husky and independent youngster in the last decade, according to recent figures adduced by the Automotive Industries of Canada, the National Automobile Chamber of Commerce of the Dominion. From almost negligible proportions a few years ago, the business has grown to an extent that it is now employing more than 15,000 persons and represents an investment of more than $100,000,000. In the last year more than 94,000 motor vehicles were manufactured in Canadian plants, a production which probably will be increased by at least 35 per cent in 1920 despite the present material, coal and labor situation.

Canada, however, is still a great importer of automotive products of the United States and it is noteworthy in this connection that there is one car owned for every twenty-eight persons in the Dominion.

This is despite the fact that the average cost of cars there is approximately 70 per cent greater than in the United States due to the imposition of customs, war and war excise taxes.

Registrations in Canada for 1919 increased approximately 25 per cent over those of 1918, the total gain in the number of cars being 67,890. The gain was distributed fairly evenly among the provinces with Ontario in the lead and Saskatchewan, Alberta, Manitoba and Quebec following in the order named.

Last season Canada imported some 12,000 motor vehicles, of which nearly 10,000 were passenger cars. This, together with the fact that the 1920 figures shows only 68,000 new registrations, means that Canada exported at least 40,000 cars, a figure which, computed on the basis of relative population, means that Canada does five times as much export business as the United States.

Automotive manufacturing activities in Canada are virtually confined to the province of Ontario. Here are located Willys-Overland, Ltd., three large plants of the General Motors Corp. of Canada and numerous other big factories, not only of cars but of accessories, parts and equipment as well. Tire and rubber companies also are invading the Dominion to a marked degree.

Getting Up in the World

New York is to adopt raised platforms for the use of its traffic officers to enable them to handle motor traffic more expeditiously and with less danger to themselves. Above is one of the platforms to be erected at all corners where many motor cars or trucks pass.

PARAGON TO PRODUCE BY SUMMER

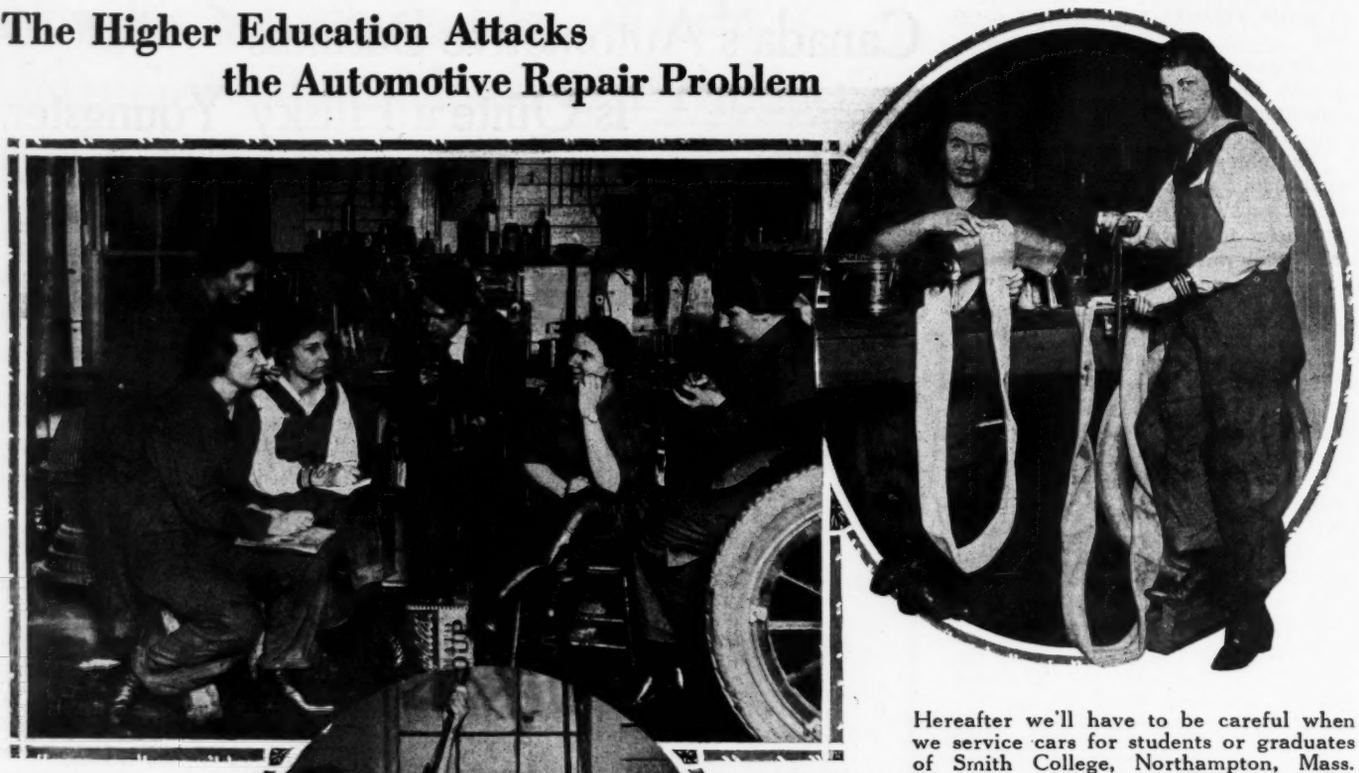
Connellsville, Pa., Feb. 24—Production of the new Paragon car, the creation of the Paragon Motor Car Co., whose factories are to be erected in this city, is expected to begin in early summer. The Paragon is to be made in three models—five-passenger touring, four-passenger sport car, and two-passenger roadster, mounted on a standard chassis with a wheelbase of 122 inches. The weight will be under 3000 lbs. and the list price about $3,000.

Paul F. Hackenthal, vice-president and chief engineer of the company, is the designer of the new car and engine. He was formerly assistant chief engineer at the Mercer and Templar plants.

The car is designed along low hung lines, and is to be powered by a 3¼ in. bore by 5⅛ in. stroke overhead valve, high-speed, high-compression, four-cylinder engine, developing over 50 hp. Both engines and cars are to be built throughout at the Connellsville plant. The engine is said to have a unique method of carburetion, careful balancing to minimize vibration and a highly perfected overhead valve action, provided with positive lubrication.

Connellsville is located on the pike leading to the Lincoln and National highways. Four railroads touch the city. The famous Uniontown hill and speedway, nearby, will be used for tests.

The Higher Education Attacks the Automotive Repair Problem



Hereafter we'll have to be careful when we service cars for students or graduates of Smith College, Northampton, Mass. The Smith girls are learning automotive repair work in Jean Charleboi's Automobile School and are said to be very proficient at the tasks set them.

Upper Left — The professor gives an illustrated lecture to an attentive class; upper right, repairing tires will be easy after this class has been passed; lower left, the Smith college girls believe in having adequate equipment, so lifting out and replacing engines is a perfectly simple operation for them; lower right, and they can even change tires without the customary cerulean conversation, even if they do happen to attend a college located near Boston.

TRUCK OWNERS DO NOT LIKE NEW LAW

Philadelphia, Feb. 20—Forty central stations for the operation of motorcycle members of the Pennsylvania State Police will be established along State main highways this spring, primarily, it is announced, "to capture violators of the State automobile regulations and motor bandits."

The stations will be connected by telephone, so that warnings may be communicated, not only between stations, but to the local authorities. In addition, it is planned to have policemen patrol the highways on motorcycles, instead of on horseback. Before establishing the motorcycle squad, the State Police authorities will communicate with banking, commercial and other organizations, so that a system of co-operative warning in event of robberies and thefts from motor trucks in transit, can be worked out. One suggestion is for a sign in front of certain stations which will warn a policeman privately, in passing, and summon him to a telephone.

Certain motor trucking companies regard this telephoning co-operative system and motorcycle patrols as an attempt of the State authorities to make more vigorous than ever the difficult State laws with regard to traffic on the highways. The Bureau of Standards, at Washington, has been testing two sets of Troll-Loadometers, machines to weigh trucks and loads, that the State Department of Highways has had made for detecting violators of the truck load weight law and these, it is expected, soon will be placed, as a try-out at certain strategical positions on certain highways. The Troll-Loadometers are manufactured by the Black & Decker Mfg. Co. of Baltimore, makers of portable electric tools, electric air compressors and special machinery. Each of the State's automobile inspectors eventually will be equipped with a set of load weight detectors of this nature.

Viking Sixteen Cylinder Airplane Engine

Develops 140 H P. at 1600 R.P.M. A Fine Mist of Oil Lubricates Whole Engine

A NEW and unusual development in the airplane engine field is the Viking engine made by the Detroit Manufacturers Syndicate, Detroit. Sixteen cylinders are incorporated into an X shaped design that has four rows of cylinders for each of the four legs of the letter X. The cylinder bore and stroke is 3¼ by 4 in., which gives a piston displacement of 530 cu. in. The horsepower development is 140 at 1600 r.p.m., so that this engine develops 1 hp. for each 3.79 cu. in. of piston displacement, which is remarkably low, and 1 hp. for 2.83 lb. weight, which includes magneto and carbureter weight.

The cylinders which are air cooled are made of semi-steel, and are bolted to the crankcase with four base bolts and four long extension bolts secured to the top cooling flange. The crankcase is made of aluminum alloy. Internal braces are employed which span the interior every 4½ in. Thirty-six inches is the total length of the crankcase, which gives seven webs in the interior. These webs or braces support the main bearings for the crankshaft.

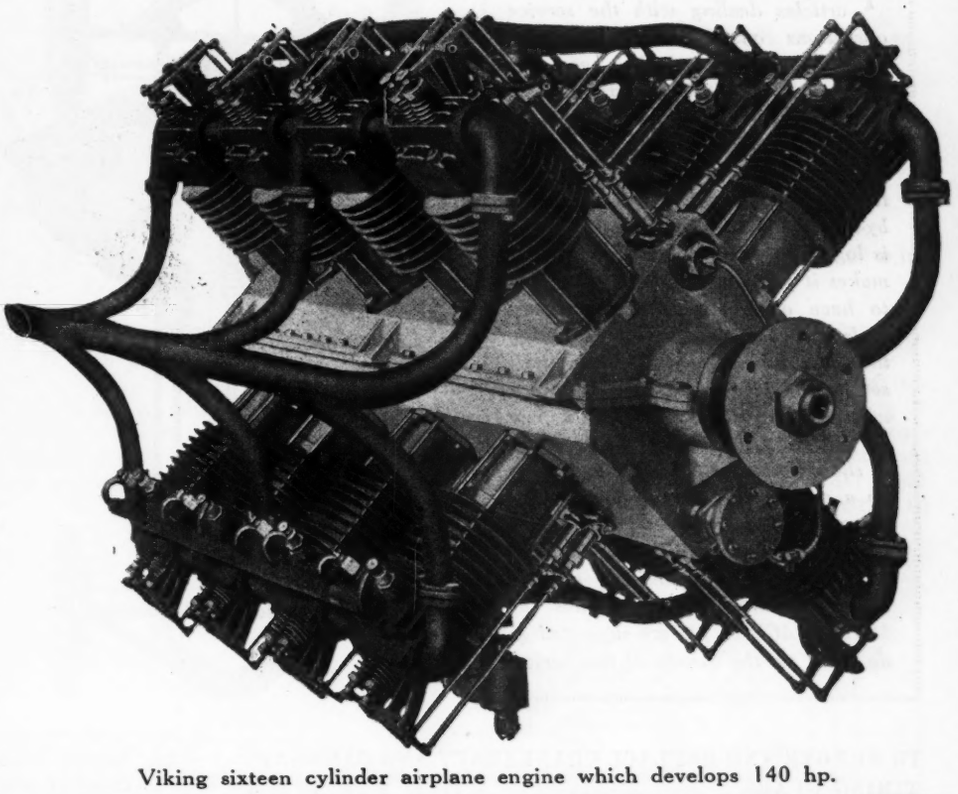
The crankshaft is built up and has eight throws. The cylinders are staggered which provides the means for the bearings between each of the main bearings. A main bearing is also fitted on the extreme ends of the shaft for the support of the propeller. All crankshaft bearings are ball. The connecting rods use fifteen ⅝-in. ball bearings. Two camshafts are used. One is directly above the crankshaft and the other is below. Each uses plain bearings.

Aluminum Alloy Pistons

Connecting rods are of Vanadium steel. They are drop forged and machined all over to reduce weight as much as possible. A light press fit on the lower rod is used, over the ball retainer race and a tight press fit on the upper pin bearing. The piston pin is made of cold drawn hollow steel tubing, hardened and ground. The connecting rods are placed side by side on the crankshaft throw, and are all interchangeable.

The pistons are of aluminum alloy, of the hour glass type. The valves are of two-piece construction, having semi-steel heads with nickel-steel stems welded to the head. Valve diameters are 1⅝ in. O. D., having a throat diameter of 1 7/16 in. Operation is by overhead valve rockers and pushrods from mushroom tappets. Ignition is by Dixie high tension magneto.

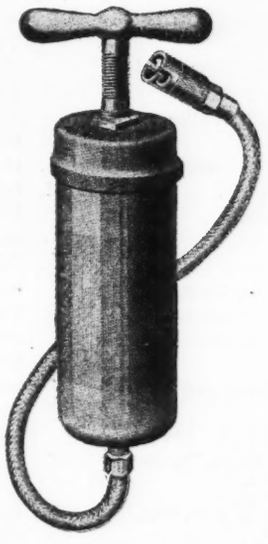
A fine mist of oil serves to lubricate the whole engine. Two oil pumps are employed. One creates a high pressure for the oil, which forces the oil through the upper hollow camshaft. From here the oil is directed against the rods in tiny streams from jets located in the camshaft and directly opposite each rod and main bearing. After the oil is sprayed out in this fashion the second oil pump does its work by removing this oil from the crankcase.



Viking sixteen cylinder airplane engine which develops 140 hp.

Alemite System of Chassis Lubrication

Ordinary Grease and Oil Cups are Eliminated



Compressor used to force grease into bearing

A chassis lubricating system, known as Alemite lubrication, has been developed by a Chicago concern, with a view to obviating the trouble and messiness of the ordinary grease lubrication. The ordinary grease and oil cups are eliminated, and nipples containing ball check valves are substituted therefor.

A compressor or grease gun of special construction, with a 15 in. flexible steel hose, is adapted to connect to these nipples by means of a bayonet joint, and grease can then be forced into the bearings through these check valves under a high pressure, which insures that lubricant will reach the most remote parts of the bearings.

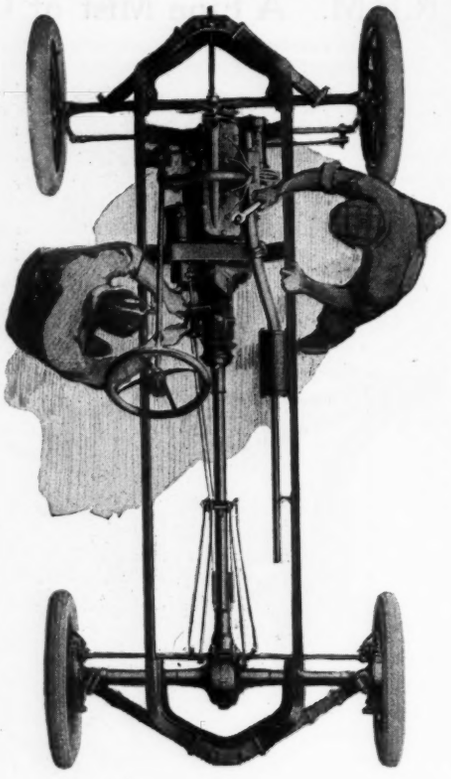
The cylinder of the compressor is made of No. 16 gage steel, knurled to prevent its turning in the hand. The compressor, with delivery hose complete, can be readily stored in the tool box. Ball check valve nipples are made in four sizes, viz., 1/8 in.-32, ⅛, ¼ and ⅜ in, standard pipe size; they are made both in the straight and elbow type, the latter being used to make inconvenient places more accessible.

The flexible hose enables the operator to fill the bearing with grease in a comfortable position, and to force the grease into the bearings under a high pressure, up to 500 lb. per sq. in. if necessary.

It is claimed for the Alemite system that it permits of lubricating a car in much shorter time than where grease cups have to be filled in the ordinary way, and, besides, it is not necessary to grease the car so often.

SERVICING THE OVERLAND FOUR

THIS is the second of a series of articles dealing with the service operations on the Overland Four. The work as it stands has been prepared by the Willys-Overland Co., and the dealer will find at the head of each operation the amount of time required to do the job. The operations have been put down in a step-by-step method so that one operation is logically followed by the next. This makes it possible for the service man to have on hand all the necessary tools and equipment before beginning the job. Incidentally the time limit set for the job affords a ready means whereby the skill of the mechanic can be judged. Other things being equal it should not take a man longer to do a certain job than herewith mentioned, as the service department of the factory has established these limits after much experimenting. Dealers who are not keeping copies of MOTOR AGE on file are suggested to do so to get the benefit of this series.



Part II—The Engine

THESE valuable articles—Servicing the Overland Four—will run serially each week until the service operations on the entire car have been explained. This week deals with the

Engine

Next week will be a continuation of the service operations on the engine.

Keep a file of MOTOR AGE for ready reference. The flat-rate system of estimating on a job has been proved the best plan to make your service work pay you high profits, eliminate complaints and satisfy your customers. The time given here for each service operation can be adapted to the flat-rate system of estimating cost of repair jobs on cars of this class.

TO REMOVE AND REPLACE CRANKSHAFT AND CAMSHAFT TIMING GEARS Time: 1 hr., 15 min.

1. Remove hood.
2. Drain radiator.
3. Remove front splasher by removing one 15/16-in. cap screw, two 3/8-in. cap screws, and two 1/4-in. stove bolts.
4. Disconnect battery cable at battery. Disconnect wires from lamp sockets, and pull lamp wires through shroud and radiator shell.
5. Remove lamp stay-bar.
6. Remove cap screws holding radiator shell to frame and remove radiator shell.
7. Remove 15/16-in. nut on radiator stay rod at radiator bracket and pull rod out of radiator bracket.
8. Remove two 5/16-in. bolts with nuts and lock washers from starting crankshaft bracket at radiator.
9. Remove two 3/8-in. radiator holding-down bolts .
10. Loosen radiator hose clamps.
11. Remove radiator.
12. Remove two 5/8-in. engine bolts, nuts and lock washers, one machine screw and nut, and remove front splasher.
13. Remove fan belt by bearing down on grease cup over fan spring.
14. Drive pin out of fan drive pulley on crankshaft and pry off with two medium sized screwdrivers.
15. Remove engine gearcase cover by removing seven 5/16-in. cap screws with lock washers and three 3/8-in. generator bolts and lock washers.
16. Install one generator bolt to hold generator in position.
17. Crank engine until all gear marks register.
18. Pull cotterpin out of cam gear nut.
19. Remove cam gear nut and flat steel washer.
20. Remove crankshaft gear, using S. D. No. 218 gear puller, as shown in Fig. 4.
21. Pry off crankshaft oil thrower with two medium size screwdrivers.
22. With S. D. puller No. 273, pull off crankshaft gear as in Fig. 5.
23. See that gear key is properly fitted in shaft.
24. Install crankshaft gear with the gear markings to front of engine.
25. Use hollow drift-punch in setting gear against shoulder on crankshaft. Put on crankshaft oil thrower.
26. See that cam gear key is in camshaft. It is quite probable when pulling cam gear that spring pressure will throw camshaft out of time.
27. With an open end wrench, bring cam gear key in line with cam gear keyway, with marks on gears in proper register.
28. Use hollow drift-punch and drive cam gear to shoulder on camshaft.
29. Put on camshaft washer and nut. Tighten and cotterpin.
30. Remove generator bolt.
31. Install engine gearcase cover.
32. Install seven 5/16-in. cap screws, lock washers under heads, and three 3/8-in. cap screws with lock washers under heads, holding generator to engine gearcase.
33. Install radiator, fastening with two 3/8-in. cap screws, lock washers and nuts.
34. Fasten starting crankshaft bracket to radiator with two 5/16-in. bolts, lock washers and nuts.
35. Install front engine shield with engine holding down lock washers and nuts.
36. Install radiator shell, lacing headlight wires through radiator shroud and radiator shell.
37. Install front splasher, lining up holes in radiator shell and splasher with holes in frame.
38. Install one 5/16-in. cap screw, two 3/8-in. cap screws, and two 1/4-in. stove bolts holding radiator shell and splasher to frame.
39. Attach headlight wires to headlights and replace battery cable.
40. Connect radiator hole clamps.
41. Put on lamp front stay-bar.
42. Connect radiator stay-rod to radiator bracket with 5/16-in. nut.
43. Fill cooling system with water.
44. Put on hood.

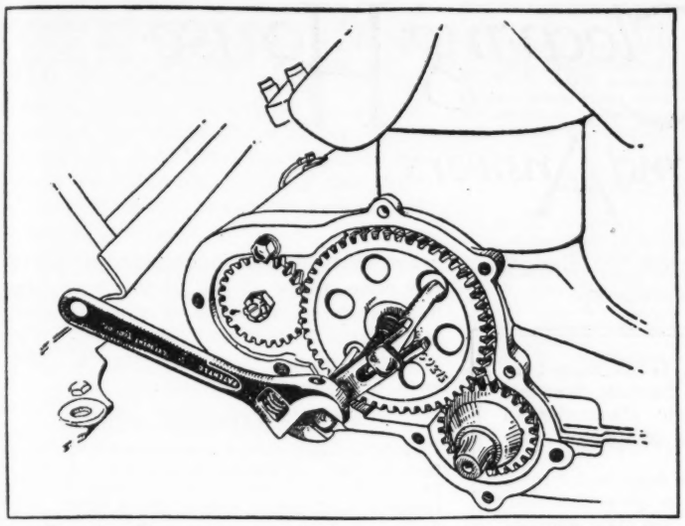


Fig. 4.—Removing camshaft gear, using S. D. 218 puller

TO REMOVE AND REPLACE GENERATOR Time: 30 min.

1. Remove hood.
2. Remove spark control and primary wires to distributer.
3. Remove distributer and timer binding screws holding distributer to generator.
4. Remove distributer.
5. Remove three ⅜-in. generator holding-down bolts in front of gearcase.
6. Remove generator. Generator can also be removed with distributer attached as shown in Fig. 6.
7. Replace generator, screwing in three ⅜-in. generator holding-down bolts.
8. Remove No. 1 spark plug.
9. Crank engine by hand until No. 1 piston completes its travel in compression stroke.
10. Crank engine slowly, inserting wire in spark plug hole to determine when piston is flush with the top of the cylinder.
11. Full retard control lever on timer.
12. With the distributer arm pointing toward No. 1 plug wire contact post and the breaker points just starting to open, with spark plug fully retarded, clamp distributer into position on generator.
13. Replace distributer cover.
14. Connect spark control and primary wires to distributer.
15. Replace hood.

TO REMOVE AND REPLACE CARBURETER Time: 20 min.

1. Shut off supply of gasoline at tank.
2. Disconnect gasoline line at carbureter.
3. Disconnect choke wire, by backing off brass set screw.
4. Disconnect throttle wire.

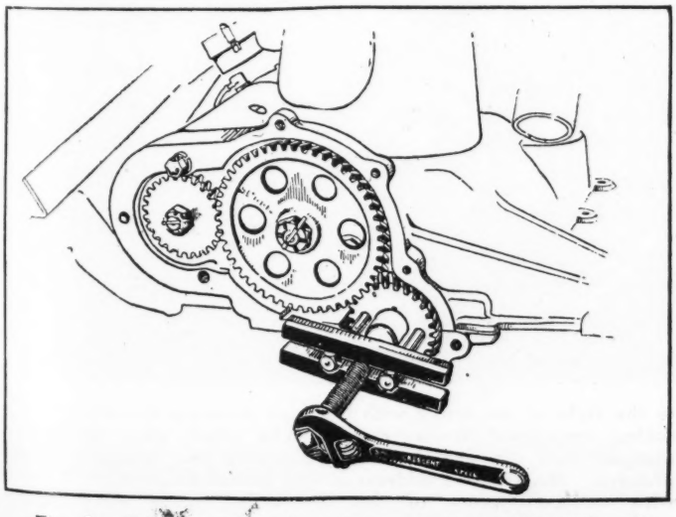


Fig. 5.—Removing crankshaft gear, using S. D. 273 puller

5. Disconnect accelerator, by removing one cotterpin.
6. Loosen three ⅜-in. nuts holding hot-air stove to exhaust manifold.
7. Remove two ⅜-in. nuts and lock washers, holding carbureter to engine block and remove carbureter.
8. Connect throttle wire to carbureter and place carbureter to cylinder block, using lock washers and two ⅜-in. nuts.
9. Tighten three ⅜-in. nuts holding hot-air stove to exhaust manifold.
10. Replace choke wire, setting up brass screw.
11. Replace throttle wire.
12. Connect accelerator rod with cotterpin.
13. Connect gas line at carbureter.
14. Open gasoline supply to carbureter.
15. Adjust carbureter.

TO RETIME IGNITION Time: 30 min.

1. Retard spark control wire.
2. Lift hood.
3. Remove distributer cap.
4. Remove No. 1 spark plug.
5. Hand crank engine until No. 1 piston comes to top center of compression stroke; then slowly until top of piston is flush with top of cylinder block. At this position, the distributer arm should be coming in contact with No. 1 plug wire contact post in distributer head and the breaker points in the timer just starting to open with timer fully retarded.

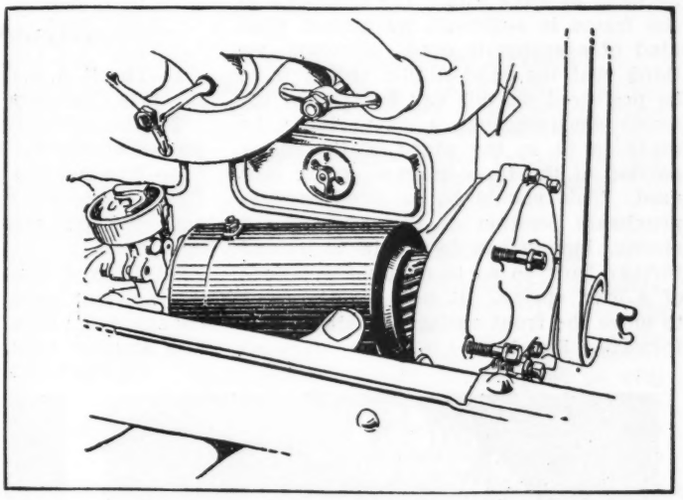


Fig. 6—Proper manner to remove generator

6. If the timer-distrubuter is found to be out of time, loosen clamp bolt holding distributer to generator and time by remeshing gears.
7. Install distributer cover.
8. Install No. 1 spark plug.
9. Attach plug wire.
10. Put down hood.

TO ADJUST PUSH RODS Time: 30 min.

1. Remove hood.
2. Remove all spark plugs.
3. Hand crank engine until No. 1 piston is on top center of compression stroke.
4. Remove valve covers.
5. Adjust intake and exhaust push rods by loosening pushrod lock nuts so that there is .003 in. clearance between pushrod and valve stem. Lock securely.
6. Hand crank engine until No. 3 piston is on compression top center, and adjust pushrods as outlined in operation No. 5.
7. Follow same operations for No. 4 and No. 2 cylinders.
8. Replace spark plugs.
9. Connect plug wires.
10. Replace hood.

The Readers' Clearing House

Questions and Answers

Conducted by Roy E. Berg

Technical Editor—Motor Age

THIS Department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

CHANGING SPRINGS ON DODGE

Q—Could the rear springs on a Dodge Brothers car be taken off and cantilever springs be installed or would it be so high the body would swing sidewise? Could an arm be spliced on the frame to extend back and a long straight spring be used similar to the one on a Hudson Speedster?

2—What is the horse power of a six-seven passenger Chalmers model 18?

3—What is the bore and stroke of the engine?

4—This car uses a 37 by 5 in. tire. Which size would be best according to standard to cut the wheel down to fit a 33 by 5 in. tire or a 34 by 5 in.?

5—Can the gear ratio on an Overland model 75 be changed by just enlarging its bevel pinion without a new gear ring?—R. D. Baxter, Cheney, Kan.

1—Let us say that any change can be made, providing that it is reasonable and that sufficient tools and material are on hand to work with. The clearance of the frame is sufficient, no matter what kind of a spring is used. However, we think that the semi-elliptic spring is to be preferred on this car because of the frame construction. A channel can be made to fit in the place of the upper portion of the three-quarter spring now used. This should be assumed the approximate position of this part of the spring, but it can be made to extend further back so as to obtain the benefit of a long spring. It may be necessary to move the front spring shackle farther forward. Fig. 1.

Miscellaneous

2—The N. A. C. C. horsepower rating of the 1918 Chalmers is 25.35.

3—The 1918 Chalmers has a bore and stroke of 3¼ by 4½.

4—Why not use a 33 by 5 in. tire? This tire is becoming standard, and it is now equipped on many cars as standard equipment.

5—No, you can not change the ratio of the rear axle bevel gears by just changing the ring gear. There is a certain angular relation between these two gears that must be maintained. Half of the cone angle of the pinion gear plus half of the cone angle of the ring gear must equal 90 deg. and this would not be the case if the ring gear was changed without changing the pinion gear.

WANTS ROADSTER DESIGN

Q—Publish sketch of roadster body for a 1917 Premier 6-chassis, showing 32 by 4½ solid steel wheels, bicycle type fenders and extra wheel flush with rear deck.

2—Publish sketch of Singer type rear deck attached to back of front seat (tonneau removed) of Premier 6-B touring car, with bicycle fenders, solid wheels and low top.

3—Give a list of concerns who would rebuild cars according to the above descriptions.—Cutler K. Alward, Urbana, Ill.

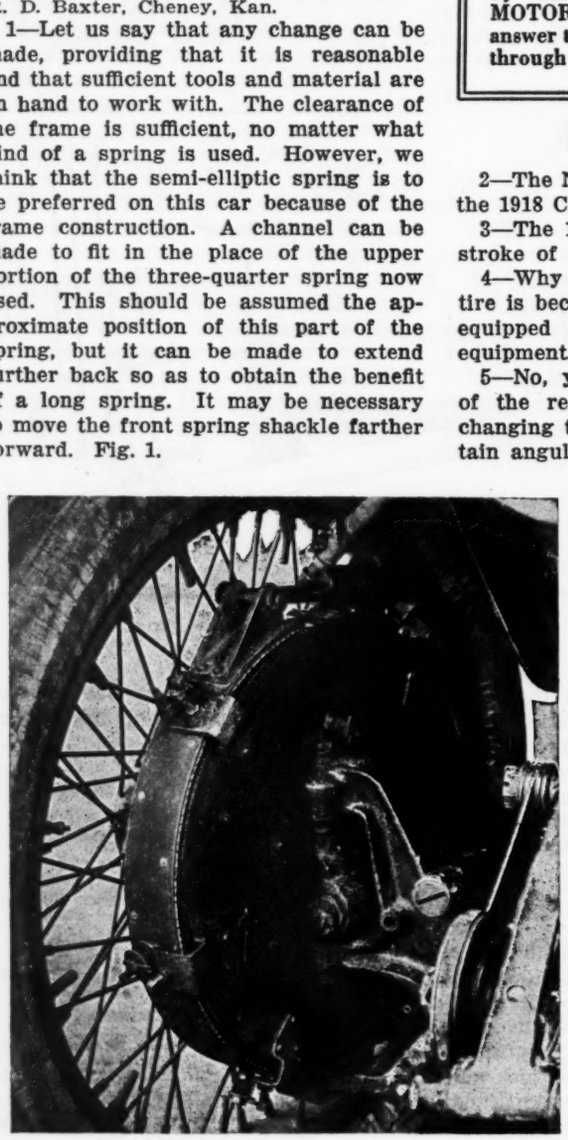
1—Owing to the unprecedented influx of inquiries, the Dealers' Clearing House Department is so far behind its schedule that we find it rather difficult to comply with requests for car designs at this time. Perhaps, by looking through your old issues of MOTOR AGE. you will be able to find a car design that is suited to your requirements.

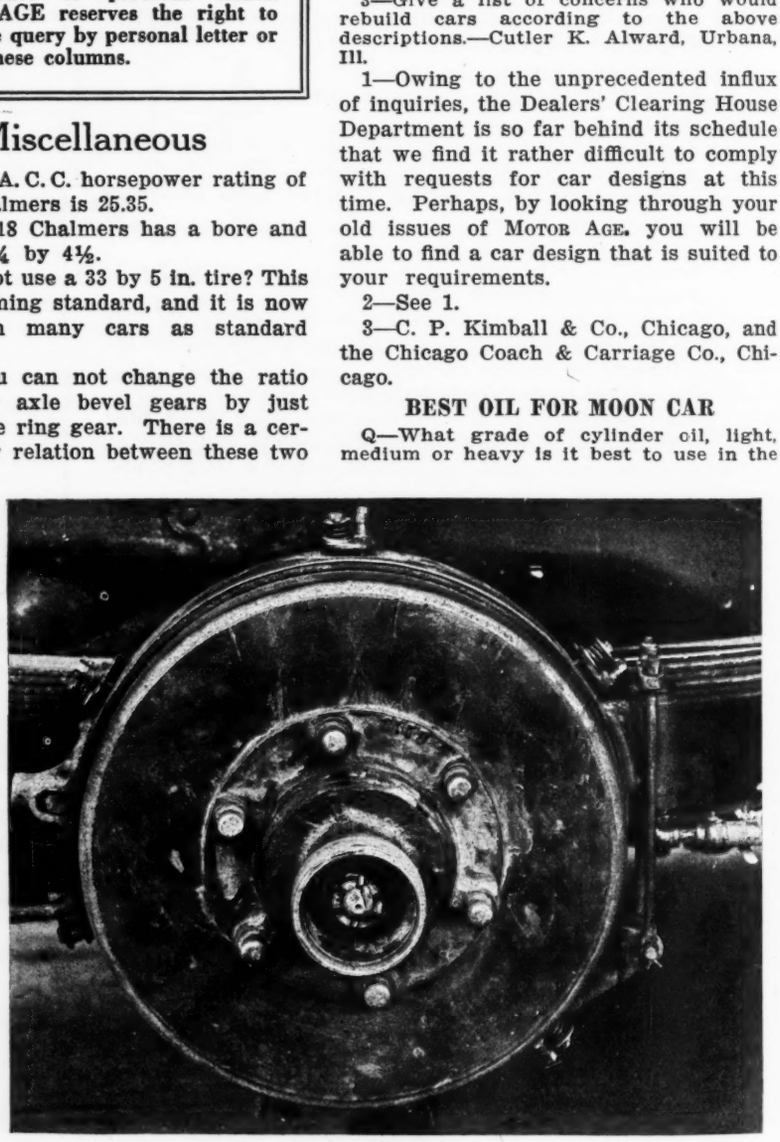
2—See 1.

3—C. P. Kimball & Co., Chicago, and the Chicago Coach & Carriage Co., Chicago.

BEST OIL FOR MOON CAR

Q—What grade of cylinder oil, light, medium or heavy is it best to use in the





APPLICATION of brakes to front wheels has long been a problem of design that has caused much difficulty, but which has been worked out quite satisfactorily in Europe and is now extensively on cars there. This picture shows the hydraulic front wheel brake as has been worked out recently by C. W. Gugor of San Francisco. The side view shows the plunger to the right of the brake with the high pressure flexible metallic tubing connected to the drum. The other view shows the plunger with the flexible tubing carrying the pressure to the plunger. Mr. Gugor's address is 815 Mason St., should any one wish to learn more of this interesting front wheel brake application.

engine of a Model 90 Moon car during the spring and summer season? The piston rings and cylinder walls are in fine shape.—W. W. Williams, Quincy, Ill.

1—It is advisable to use a medium grade of cylinder oil during the spring season as the temperature under which you operate does not reach either the cold or hot extreme. During the summer season use a heavy oil because of the continuous heat.

QUERIES ABOUT SPEEDOMETER

Q.—On an Oldsmobile eight-cylinder, the speedometer is driven from the drive shaft. How many teeth should the small fiber pinion have?

2—What causes a Stewart speedometer to register 40 to 50 m.p.h. when the car is only going about half that speed?—Hamilton, Grove City, Ohio.

1—The exact number of teeth on these gears is not known by us, but the ratio of the teeth should be 16 to 13. That is if the drive shaft makes 13 revolutions the speedometer gear should make 16.

2—First we must ask if this is a constant indication. That is the reading of the meter always in the same proportion. If it is, then, of course, there is something wrong with the gears applied to the car. But if this reading is intermittent, and at some speeds registers correctly, then there is something loose in the driving mechanism of the speedometer. Examine the gear on the speedometer shaft. If this is loose and slides back and forth, then the screw holding the large driven gear to its shaft is probably loose.

ASKS ABOUT STEAM CARS

Q—Where is the Stanley steamer car manufactured?

2—Give a list of steam cars. Is this type of car practical for long tours, where it is necessary to use different grades of water?—W. D. Van Valkenburg, Hagerstown, Md.

1—The Stanley steamer is manufactured by the Stanley Motor Car Co of Newton, Mass.

2—The Stanley steamer is the only steam car manufactured.

This type of car is practical for long tours as the engine runs condensing and is able to utilize the water returned to the boiler from the condenser. The number of miles it is possible to travel with a filling of water varies according to the condition of weather and road travel, and ranges from 250 to 400 miles.

It is not necessary to use different grades of water but it is advisable to use a clean water that does not contain factors which will cause excessive scale. The violent action caused in the generation of the steam prevents the scale from accumulating in any great degree and it is very easy to prevent a collection of scale by blowing out the boiler frequently.

TO assist readers in obtaining as a unit all information on a certain subject MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

Miscellaneous

R. D. Baxter.....Cheney, Kans.
Cutler K. Alward.....Urbana, Ill.
W. W. Williams.....Quincy, Ill.
Glenn E. Hamilton....Grove City, O.
W. D. Van Valkenburg.....Hagerstown, Md.
Ira Edwards.....Malden, Wash.
A Reader.....Goshen, Ind.
W. W. Williams.....Quincy, Ill.
C. E. Byrd, Jr.....Shreveport, La.
Harry E. McKee.....Jefferson, Ore.

Carburetion

John Weiss.....Naugatuck, Conn.
A Reader.....Goshen, Ind.

The Engine

T. J. Scuttish....Pacific Grove, Calif.
A Reader.....Goshen, Ind.
Lester Watson.....Greenville, Miss.
Glenn E. Hamilton....Grove City, O.

The Electric System

Alvin Steinberg.....Tilleda, Wis.
O. M. Torgerson.....Wheaton, Minn.
Montrose Bros.....Utica, Ohio
Glenn E. Hamilton.....Grove City, O.
Clifford Graham....McCool Jct., Neb.

Repainting

Elmer Trede.....Floydada, Tex.

ADJUSTMENT ON CHEVROLET CLUTCH

Q—Is there any adjustment on the clutch of the Chevrolet 490? Ira Edwards, Malden, Wash.

There is a means of adjusting the clutch on the Chevrolet car and if you will refer to Fig. 2 where an illustration of the transmission and clutch used on this car is shown, you will see that this is so. This is a cone clutch. There are two means for taking up for wear and when this fails to provide the necessary amount of adjustment you will have to use new clutch leather. First it might be that the leather is worn so that the clutch pedal is prevented from moving all the way back by the floor boards. In this event the turn buckle arrangement to the left of the foot pedals and beneath the floor boards, should be loosened. The other means for adjustment is the cone leather springs which press the leather out against the surface of the flywheel. These should be tightened.

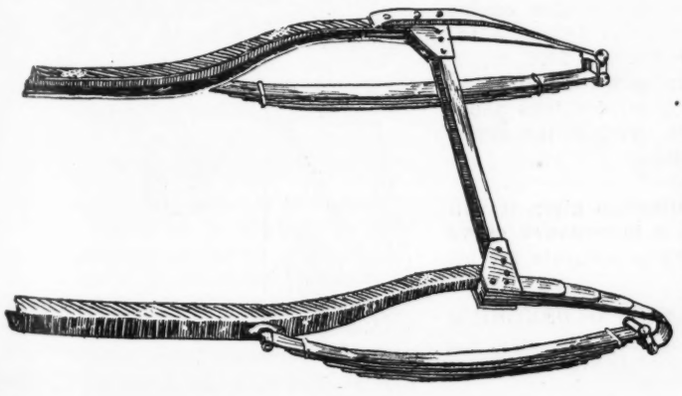


Fig. 1—Showing a method for using a semi-elliptic spring on a Dodge frame. The rigid portion can be fitted to the spring fastening member just as the upper portion of the three-quarter spring is now fitted

DISCONTINUED TIRE SIZES

Q—Will the manufacture of 3½ by 34 in. casings be discontinued by all tire manufacturers? If not, give the names of the concerns who will continue to manufacture them.—A Reader, Goshen, Ind.

This is one of the tire sizes that is to be discontinued, but you can undoubtedly secure them still from one of the following: The Ideal Tire and Rubber Co., Cleveland, Ohio; Thermoid Rubber Co., Trenton, N. J.; The Combination Mfg. Co., Bloomfield, N. J.

REFILLING PREST-O-LITE TANKS

Q—Where is it possible to have Prest-O-Lite tanks on a model 90 Moon car refilled?—W. W. Williams, Quincy, Ill.

1—We advise that you take the matter up with the Prest-O-Lite Co., Indianapolis, Ind.

BOY, PAGE MR. KNIGHT!

Q.—Publish the full name of Mr. Knight, the designer of the Sleeve Valve engine.—C. E. Byrd, Jr., Shreveport, La.

The full name of the designer of the sleeve valve engine is Charles Y. Knight, Oak Park, Ill.

HOOSIER CARBURETER

Q—What are the advantages of using a Hoosier carbureter?—Harry E. McKee, Jefferson, Oregon.

Candidly, we don't know. The Hoosier Sub-Carbureter Co. has supplied us with a pamphlet, which claims much for the carbureter. But outside of this we know nothing of the carbureter. It is true that the company which is located in Indianapolis, sells its carbureter on a very liberal basis, making it unnecessary to pay even a penny deposit on the carbureter during a thirty-day trial.

CREOSOTE BLOCK FOR FLOORS

MOTOR AGE is endeavoring to collect some information in regard to the use of creosote wood blocks for the floor of a tractor, truck and motor car display room. The idea being that the use of concrete for the floor while perfectly feasible for trucks and motor cars has not the same applicability for tractors, because of the iron cleats on the wheels which destroy the surface of the concrete. Creosote block it seems will fill the bill as far as the tractors are concerned, but there is some doubt as to the action of the creosote on the rubber tires of the cars and trucks. Any experience which any of our readers may have had in this connection will prove interesting reading to others and will be appreciated.

CARBURETION

CHANGING CARBURETERS

Q.—What kind of carbureter would give the best results on a 1913 Havers Six? It is now equipped with an old Stromberg but as the magneto is causing a great deal of trouble it is impossible to say in what condition this carbureter is.—John Weiss, Naugatuck, Conn.

The temperature at which the last vestige of present day gasoline boils away from a container is somewhere in the neighborhood of 475 deg. F. In the days when this carbureter was new the end point of the fuel, which is the temperature at which the fuel finally disappears when it is boiled in a container was somewhere around 200 deg. It does seem, therefor, that you are trying to do something with this carbureter that it was not intended to do. Be sure, though, that before condemning the instrument everything is done that will be in its favor. For instance, a carbureter cannot work properly if the magneto is not working as it should. The connections between the carbureter and the manifold should be tight. The valves must fit tightly. See that the spark plug electrodes are set at the proper clearance. If everything else is as it should be, then the trouble will be in the carbureter. If loading occurs at idling speeds, that is, if the engine sputters and runs fine but intermittently, then the carbureter is not mixing the fuel with the air properly. Adjustment may or may not correct this difficulty, depending upon the capability of the instrument. If it is an antiquated type then we advise a new one. This should be of the plain tube type, or some type that automatically compensates, as the Booty for example, because it seems that the best results are obtained with these types of instruments.

CARBURETER NEEDS ADJUSTING

Q—The manifold on a four-cylinder series 18, loads. This is especially noticeable in cold weather. How can this be prevented?—A Reader, Goshen, Ind.

Proper adjustment of the carbureter is about the only thing you can do to overcome this difficulty. If no end of adjustment will overcome the trouble you will probably have to install a more efficient manifold heating device. The fuel is getting a lot of blame these days, but there is just cause for it. Loading of the manifold is one of the evils that accompanies the use of the grade fuel. The trouble is that the air velocity through the manifold is not sufficient to carry the gasoline particles along with it, consequently a good deal of it is deposited along the turns and rough places inside the casting.

THE ENGINE

POWER CURVE FOR MAXWELL

Q.—Publish horsepower curve of 1917 Maxwell engine.

2—How many revolutions does a 1917 Maxwell engine turn over?

3—What is the best method of tightening up the rear bearing on a 1917 Maxwell crankshaft?—T. J. Scuttish, Pacific Grove, Calif.

1—This is a comparatively slow speed engine and turns over about 1700 times per minute, at which speed it develops its maximum horsepower of 21. A horsepower curve can be conveniently plotted from this data.

2—See answer to Number 1.

3—Use one of the patented wrenches that are advertised in the columns of MOTOR AGE from time to time.

CUTTING DOWN VALVE SEAT

Q—What is the proper width of seat for a valve with 1½ in. opening?

2—Is the trouble caused by particles of carbon lodging under the valves due to the valve seats being too wide?

3—Instruct how to cut down the valve seats on a Studebaker, series 17. The seats at present are more than 1-8 inch. Would it be advisable to cut them down to 1-16 in.?—A Reader, Goshen, Ind.

1—The proper width is a variable figure, that changes from time to time as the valves are ground in, and the seats reseated. Generally, a seat of about 1-8 in. or slightly more is sufficient, providing that the valve makes perfect contact with the seat for its entire periphery.

2—No, we do not think that the lodging of carbon under the seat is caused by the valves being too wide. It is probably due to the valve not making perfect contact with the seat which allows carbon to blow through the valve during the explosion stroke.

3—The valve seats as they are now, are not too wide. See that the valve clearance is right before trying to change the seating. It might be too that this carbonization of the valve seat is being caused by an improper adjustment of the carbureter. The mixture might be too rich which will cause carbonization.

POWER OF RUTENBUR ENGINE

Q—What horsepower does the Rutenbur engine develop?

2—Does the Rutenbur engine develop as much horsepower as the engine used in the Lexington car?

3—Publish power curves of the above mentioned engines. — Lester Watson, Greenville, Miss.

1—The Rutenbur six-cylinder engine whose bore and stroke is 3⅛ by 5 in., develops about 45 hp. at 2400 r.p.m. The Continental engine whose bore and stroke is 3¼ by 4½ in. develops about 40 hp. at 2250 r.p.m. This is the model used in the Lexington.

2—See 1.

3—From the information given it will be possible to plot a horsepower curve that will be sufficiently accurate for all practical purposes.

BORE AND STROKE OF OLDSMOBILE

Q.—Publish a cross sectional side and end view of the Oldsmobile eight model 44 engine.

2—What is the bore and stroke of the above mentioned engine?—Glenn E. Hamilton, Grove City, Ohio.

1—We have no cross section of this engine.

2—The bore and stroke of the 1916-1917 Oldsmobile 44 eight cylinder engine is 2.875 by 4.750.

The Electric System

TESTING FOR SHORT CIRCUITS

Q—Can a common dry cell ammeter and voltmeter be used for testing for open and short circuits in the motor car electric system?

2—Must all direct current dynamos have as many brushes as it has field magnetos? What is the difference between the results obtained from the dynamos when it has different numbers of poles and brushes?—Alvin Steinberg, Tilleda, Wis.

1—Yes, in testing for short and open circuits, be very careful not to short the ammeter across the battery or generator terminals as the current at these points will be at least 1200 amps. on a dead short circuit.

2—No. The number and size of the poles used in the design of a direct current dynamo is determined by the desired capacity of the machine. The number of ampere turns per pole should not exceed 7500 in non-interpole machines, and this factor together with the size of the field frame is used in choosing the number of poles.

The number and size of the brushes is governed by the amount of energy at the point of contact and the short circuiting effect produced by having the brushes covering too many commutator bars. Carbon brushes can carry 35 watts per sq. in with a drop of one volt at the contact.

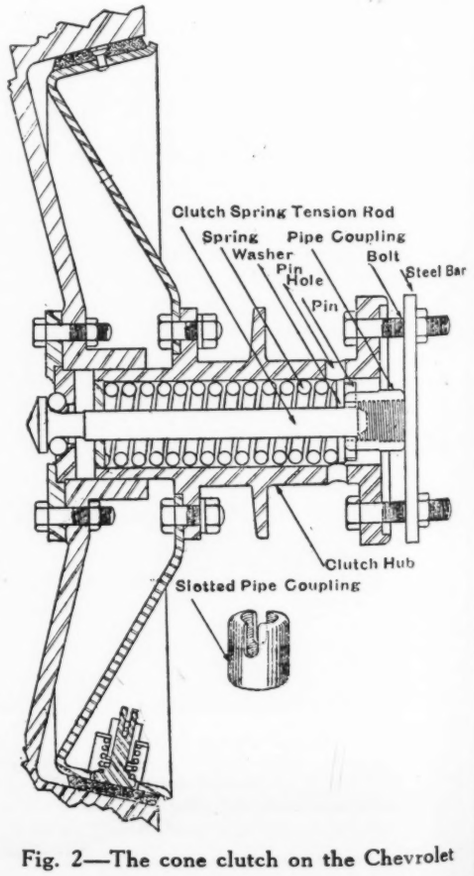


Fig. 2—The cone clutch on the Chevrolet

Therefore the difference of performance of dynamos which have different numbers of poles and brushes is entirely dependent upon the capacity and purpose for which the machine is to be used.

SPARK INTENSIFIERS

Q—What is the theory of operation of the various spark intensifiers that use an extra spark gap outside the cylinder?

2—Is it understood how this extra gap affects the spark or is it all "faith?"

3—Publish power curve of some average four-cylinder engine.

4—Publish efficiency curve approximately under the same conditions.

5—Publish efficiency curve, speed constant at the maximum power point, load varying from O to full load.—O. M. Torgerson, Wheaton, Minn.

1—Spark intensifiers will help the sparking conditions of the ignition circuit providing that all conditions are right but it is almost humanly impossible to provide these conditions. The gap between spark plug electrodes and the intensifier electrodes should be exactly the same. Furthermore the type or the shape of the electrodes should also be identical. The reason for this is that the current in coming to the intensifier first is caused to hesitate for an instant only during which instant the energy of the current is built up so that it acquires enough impetus to break the air gap between the intensifier electrodes and rushes onward to the spark plug electrodes with its acquired velocity. If the spark plug electrodes have a larger gap than the intensifier electrodes the purpose of the intensifier is defeated.

2—We do not think it is all faith. There are a number of persons who still testify to benefits they have received from using a spark gap intensifier. The writer once was enabled to get a car in only by separating the terminal from the spark plug electrodes, using a match-stick held between the spark plug binding post and tying the high tension cable to the match-stick with a piece of string. This seemed to produce an intensifying effect that would permit the spark to leap across the gap of the only spark that was in the car.

WIRING DIAGRAM OF LAMBERT CAR

Q—Publish wiring diagram of the Lambert car, model 46-C, 1914, serial number 4863. Car is equipped with Briggs Magneto.—Montrose Bros., Utica, Ohio.

The diagram is shown in Fig. 5.

WIRING OF OLDSMOBILE

Q.—Publish wiring diagram of the Oldsmobile eight model 44 engine.—Glenn E. Hamilton, Grove City, Ohio.

Delco wiring diagram for the 1916-1917 Oldsmobile 44 is shown in Fig. 4.

WIRING OF BUICK

Q—Publish wiring diagram of the model just before Buick C37.

2—Instruct how to locate a short circuit in this model.—Clifford Graham, McCool Jct., Neb.

1—The model you refer to is undoubtedly C-36, but C-37 is similar in this respect. Diagram is shown in Fig. 3.

2—The location of short circuits in the electrical wiring of any car is largely a matter of experience. With the Delco system determination of the whereabouts of a short circuit is facili-

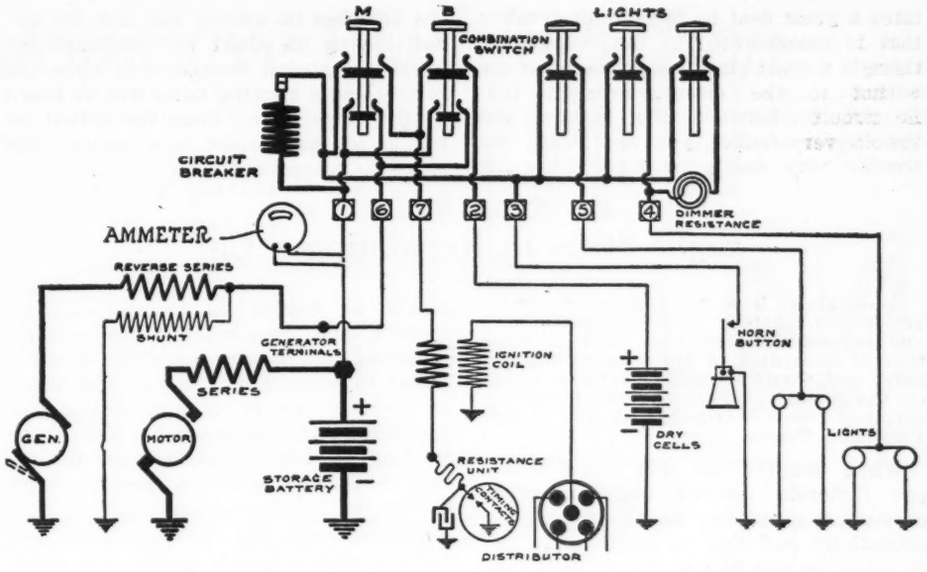


Fig. 3—The Delco system as installed on the 1915 Buick C36

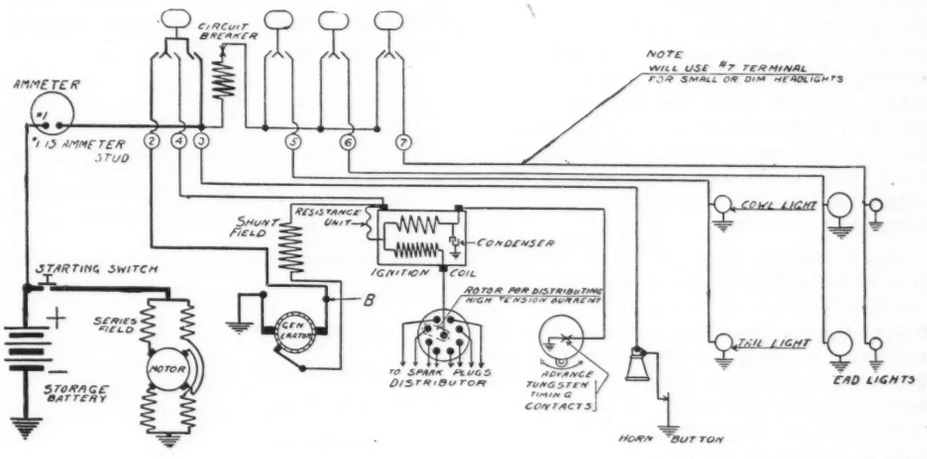


Fig. 4—Delco system as used on the Oldsmobile-8, model 44, 1916 and 1917

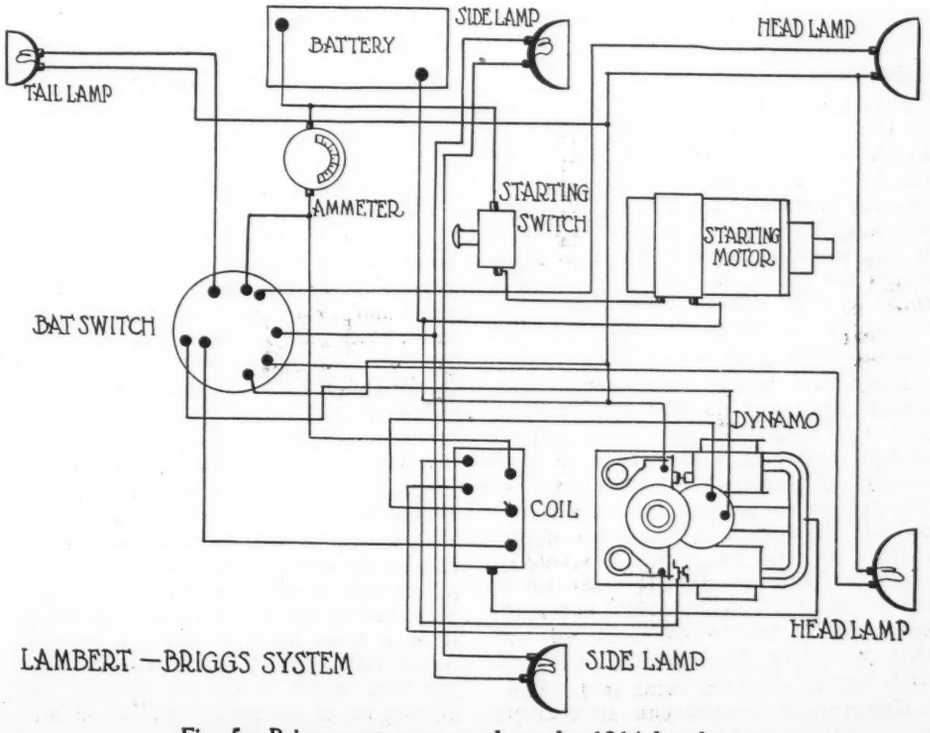


Fig. 5—Briggs system as used on the 1914 Lambert

tated a great deal by the circuit breaker that is incorporated in the switch. If there is a short circuit somewhere in the wiring to the circuit breaker, that is not in between the battery and the circuit breaker, you can locate the trouble very easily by simply turning the switches on one by one and the circuit having the short will be found because the circuit breaker will open the circuit and a clicking noise will be heard at the same time. Then the actual locating of the trouble is a matter that must be traced out.

Eight Steps in Repainting a Car

Q—Explain how to repaint medium-priced car, stating each necessary step and material needed, etc. Will a solution of concentrated lye remove the old paint and would it have a harmful effect on the metal? Where can the necessary material be obtained?—Elmer Trede, Floydada, Texas.

When one realizes that many motor car factories turning out high-grade cars allow about two weeks for painting operations and that in some instances as many as eighteen or more operations of applying paints and varnish and then smoothing down with sandpaper or rubbing stone are required to finish a body, the painting problem looks pretty big. Unless the dealer or even an owner is willing to undertake a job the value of which depends upon the care and work put into it, he should give up all idea of painting the car himself. Painting is a hard thing to do well and requires considerable time if a good-looking job is desired.

Many dealers have a vague idea of just what is done to get a beautiful mirror-like surface or even one which is not in the mirror class, consequently he either goes at the work full of confidence or is afraid to tackle it. It is far better to be aware of the difficulties that stand in the way of a good finish and, if willing to go to some trouble, to proceed with the job. It is possible to do very good work, because skill is not so essential, labor being the main item. Much can be saved in this respect by the owner doing the job himself.

Good Place to Work

Before going ahead select a good place to work. One of the main factors to watch is to keep dust from settling on the work. This can be done by sprinkling the interior of the place with a hose and keeping windows and doors closed. If the work is being done in a place where the ceiling is sand finished, hang some sort of canvas cover under the ceiling to prevent particles of dirt from coming down from the ceiling.

Many cars which have been considerably weathered so that the finish is dull, can be put in excellent condition without removing any of the old paint simply by applying the new over it. The reason the factory applies so many coats to the new body is to get a smooth surface to work on. After this once is attained it will last, provided no scratching or chipping of the paint has been done. So the foundation is laid and it is only necessary to brighten it all up with the few new coats.

However, if the old paint is in very bad condition and is rough so that it would be foolish to try to make a smooth and good-looking job without removing it, then the best thing to do is either to burn it off with a blow torch or to use one of the paint-removing specialties on the market. The blow-torch method is not advised for the inexperienced, as disastrous results might follow the improper handling.

Varnish-removing preparations are applied with a brush to the old paint. After one or two applications, the old paint should come off readily with the aid of a putty knife or similar tool. This should leave the metal's surface free of any paint whatever.

Eight steps in painting the car:

1—Remove old paint with varnish remover and putty knife.

2—Sandpaper and putty holes and cracks.

3—Apply primer.

4—Applications of rough stuff, rubbing each coat.

5—Sandpaper.

6—First color coat, let stand 24 hours.

7—Apply main color, let stand 24 hours.

8—Finish varnish coat.

Having made sure that the surface is as smooth as it is possible to get it, then wipe off any dust or other dirt carefully, and apply the first coat of paint. This is known as the primer coat and is a composition with lead in it. All paint specialists know what kind of metal primer is required for this work, and no trouble should be experienced in getting it from dealers that know the business.

Following this, there should be four coats of a filler, the common name for which is rough stuff. This is a material well known to any carriage painter and should be applied carefully and evenly at the rate of one coat a day. Where a man has to do the work at odd times, it is a good plan to apply a coat of rough stuff at night and then wait until the next night to do the rubbing and putting on of the next coat. After each coat is dry, it must be smoothed off by rubbing with a rubbing stone and water. This stone is a common article in painters' supply stores. The surface will have a very smooth and slate-like appearance after these rubbing operations are finished.

It is advisable next to sandpaper carefully the whole job, using a fine grade of sandpaper. The condition of the body now is practically the same as regards smoothness as the car would be that already had the smooth foundation of the old paint and was ready for the new finish without removing this old paint.

From this point forward the work is the same whether it is a car with the original smooth paint simply dulled or weathered or one on which the smooth foundation had to be remade by removing all paint and starting all over again in the manner just described. The only thing is to be sure the old paint, if it is not removed, is free from abrasions or rough spots where the paint has been scratched off. These should be touched up with some of the first color coat, which is next to be applied all over. Putty any cracks or holes, sandpaper the touched-up spots and puttied places, let this preparatory work stand over night, and then the car is ready for the real color painting.

Worst Part Over

The worst part of the work is now over, and to complete the job it is only necessary to apply about three more coats. The first of these is intended primarily to form a suitable ground for the color desired. It must be a mixture that will stick properly to the old paint or to the newly-prepared smooth surface, as the case may be, in short, a preparative for the real color coat. It must be applied carefully and smoothly and the utmost caution must be observed to prevent dust from settling on it.

This first color coat should be allowed to dry for about 24 hr. before applying the real color coat itself. This is the coat that gives the actual required color, and no less caution against dust is necessary. Another 24 hr. is needed to dry this coat, after which the last coat is in order. This is a clear finishing varnish of a grade suitable to go with the color used. It will dry hard enough in about 24 hr. so that dust will not adhere to it, but under no circumstances should the car be used that soon. It should be allowed to stand for one week before it is run. This gives the varnish time to set properly, and later use then will not crack it.

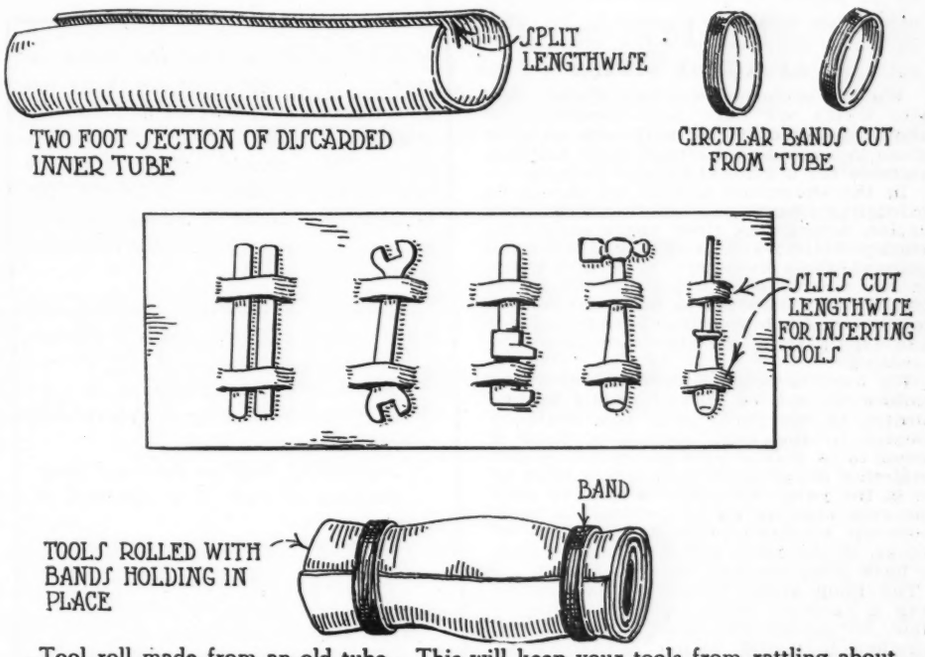
Sometimes, when a specially fine surface is wanted, a coat of rubbing varnish is put on after the main color coat and before the application of the finishing varnish. This rubbing varnish usually is applied only to the large surfaces, such as side panels, doors and back, and its only advantage is to obtain an even smoother finish and is not worth while unless the owner has plenty of time in which to wait for the car.

The Automotive Repair Shop

Practical Maintenance Hints

Tool Roll From An Old Tube

A section of an old inner tube affords a serviceable and neat tool roll, if the required tube is at hand. Simply cut out a two-foot section of the tube, cut it open at one side forming a rectangular piece. Slits to accommodate as many tools as it is desired to carry, are made lengthwise, as indicated in the sketch. Inserting the tool in these slits, the improvised carrier is rolled and secured by one or two circular bands, also cut from the tube. The tools will not rattle or clang in this rubber container, nor will the roll jolt noisily about in the tool compartment.


SPLIT LENGTHWISE
TWO FOOT SECTION OF DISCARDED INNER TUBE
CIRCULAR BANDS CUT FROM TUBE
SLITS CUT LENGTHWISE FOR INSERTING TOOLS
BAND
TOOLS ROLLED WITH BANDS HOLDING IN PLACE

Tool roll made from an old tube. This will keep your tools from rattling about in the tool compartment

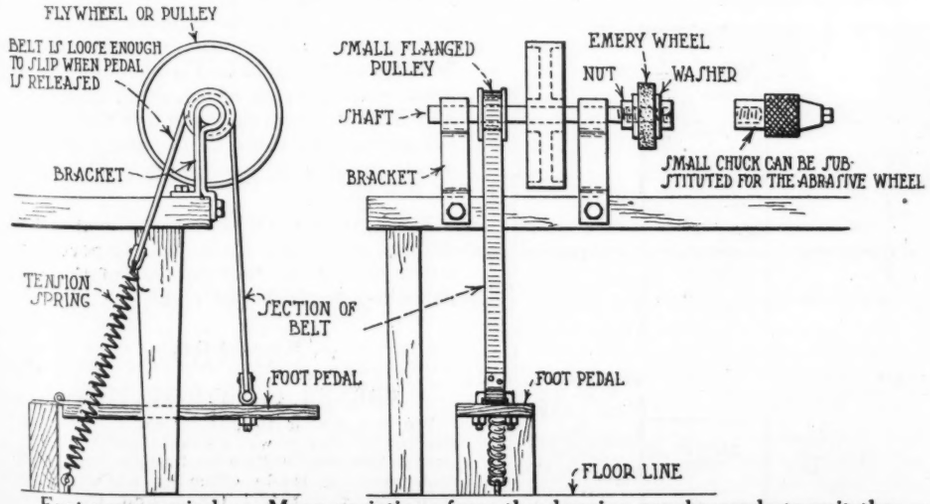
Foot-Power Grinder for Shop Use

A high speed foot-power grinder for the small machine shop that involves little work to make up is shown in sketch. It consists mainly of two vertical brackets, a threaded shaft, discarded pulley, hinges, section of belting, tension spring and emery wheel.

The hinged foot pedal connecting the belting over the shafting and to the spring, is the means of providing a very high speed, so necessary of good work with an emery or carborundum wheel. The heavy rimmed flywheel or pulley stores up the power to carry on between impulses. Many variations from the sketch to use any materials available can be made to suit the mechanics' needs. A small flanged pulley and rope can be used in place of the belt or a car, brake-wheel or large gear-wheel can be used instead of a pulley.

The spring however should have a fairly heavy tension pull of thirty pounds or more and the foot pedal which can be of wood should be fairly light, yet sufficiently rugged.

A small chuck spindle for light filing or drilling can be sustituted for the emery wheel, if the shop possesses no speed lathe. Mount the wheel on the right side when facing the bench at this place, the work is more convenient.



Foot-power grinder. Many variations from the drawing can be made to suit the mechanics' needs

Frame Jig for Fords

Usually the first time a Ford engine is overhauled the three motor supports are found to be loose and must be brazed. After this has been done it is desirable to check their location in order to determine beforehand whether they will fit when the engine is placed back into the car. Obviously the logical jig is the front half of the frame of a Ford car, and this is what should be used, mounted on a suitable stand, of course.

Don't Yell at the Fellow Who Burns His Lights In the Daytime

Many motorists do not know that there is as much danger in letting their batteries get overcharged as there is in letting the charge run too low and should be told by the dealer or garageman. Overcharging is likely to happen during long runs when the car is operated at 20 to 25 miles an hour for a number of hours continuously. At this speed the generator is delivering current to the battery at its maximum charging rate.

An overcharged battery overheats, with the result that the active material in the plates loosens and falls to the bottom of the battery, shortening its life. Most cars have an automatic cutout in the electrical system which is supposed to prevent overcharging, but this, like many automatic devices, sometimes fails to work at the proper time.

The safe way is to burn your lights, at least part of the time, when on a long drive. This takes the load off the battery and insures against overcharging.

The next time you see a motorist driving along the street at high noon with his lights on, don't yell at him.

Garage Planning
Service Station Arrangements

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and **inquiries are urged in asking for such** *plans to be user to include the following information.*

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

No. 187
A GARAGE IN AFRICA

We are enclosing a rough sketch of a site which we have just acquired and should be glad if you will send us your ideas in regard to a single-story building suitable for a general garage business.

In the showroom section we should be exhibiting cars and motorcycles, also cycles, accessories, tires, spare parts, and storage battery stocks—the manager's and general offices would also be located there. In the service station part of the building, allowance should be made for service to cars and motorcycles, battery service and repair shop, machine shop and vulcanizing.

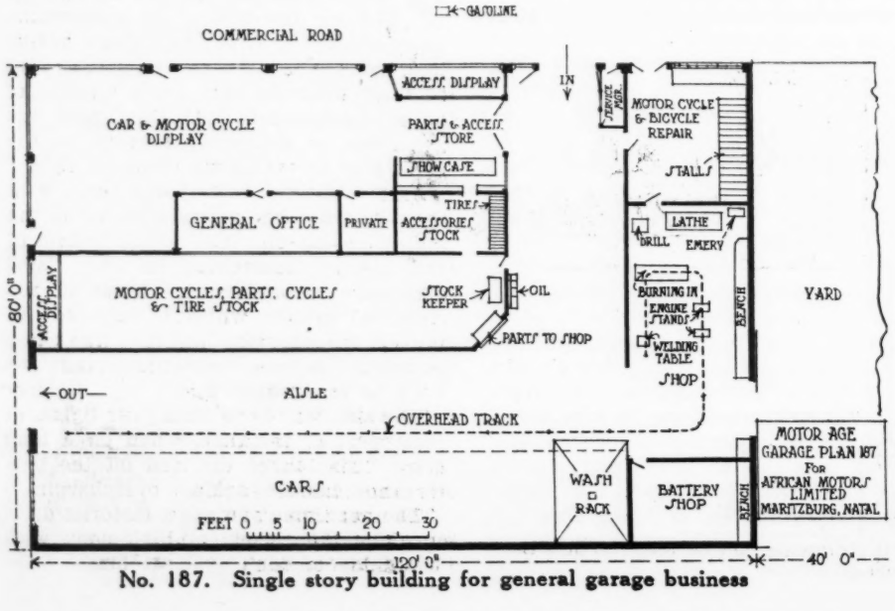
We have been considering whether the motorcycle service station should not be located in the yard, or if this could be located in the main workshop, then it seems to us that if we had a painting and trimming department, that would have to be in the yard. Our idea is to have only one door opening on to Commercial road from the service station, and another, of course, to the yard, but we shall be glad to have your ideas in regard to same.

The Loop street is more a residential than a business street, and with this in view, we should like your opinion as to whether it would be an advantage to make the entrance to showroom, etc., in the corner of the building itself, of course building to the dotted line shown in the rough sketch.—African Motors, Ltd., Maritzburg, Africa.

Since your main street is Commercial road, we suggest you take advantage of the situation by extending your show-windows along this side of the building with car, motorcycle, and accessories displayed as much as possible, both on the corner and on this side.

This change would necessitate changes in the interior arrangement. A good broad aisle is shown inside the Commercial road entrance where cars may be inspected by the service manager and estimates made on repairs or overhauling. If work is to be done on them, they are taken to the back of the building and stationed along the wall. Here heavy parts may be lifted out by means of a hoist and carried on the overhead track into the shop. Bodies could be taken into the paint-shop in the same manner and work done on the chassis while the painting is being done.

As to a paint-shop in the yard: We do not think it possible to do a good job of painting in the open, on account of dust and rain, to say nothing of changing temperature, bugs, etc. A light shed might give all the protection needed, however, and be quite inexpensive.



No. 187. Single story building for general garage business

The corner entrance is a thing of the past except for small shops, such as cigar stores, etc. Corner show windows are considered too valuable to sacrifice the space for an entrance.

No. 188
ADDING TO PRESENT BUILDING

We are contemplating building an addition to our repair-shop and want your advice for a small-town garage. We want our present building for a repair-shop only. The addition to be used for storage, salesroom and accessories.

All we want is salesroom to handle two cars and one truck, about a $2,000 stock of accessories, mostly tires, will be handled, rest rooms, wash-rack, small battery room and an office accessible to the salesroom.

We do not operate a machine-shop or do vulcanizing. We expect to operate six mechanics in our repair department. Would you advise a main street entrance to the garage?—Cruce-Farish Garage, Morrilon, Ark.

Although we have shown an entrance on Main street, there is no question but that your plan would be much better and your showroom much larger if the side-street entrance only were used; then your office could be at A and the space B, which otherwise would be reserved for the aisle, could be used for storage. The space then could be used as a men's room and cars taken into the showroom through it by moving aside the furniture. Then, too the showroom is too small for three cars unless the accessory store is put in the rear.

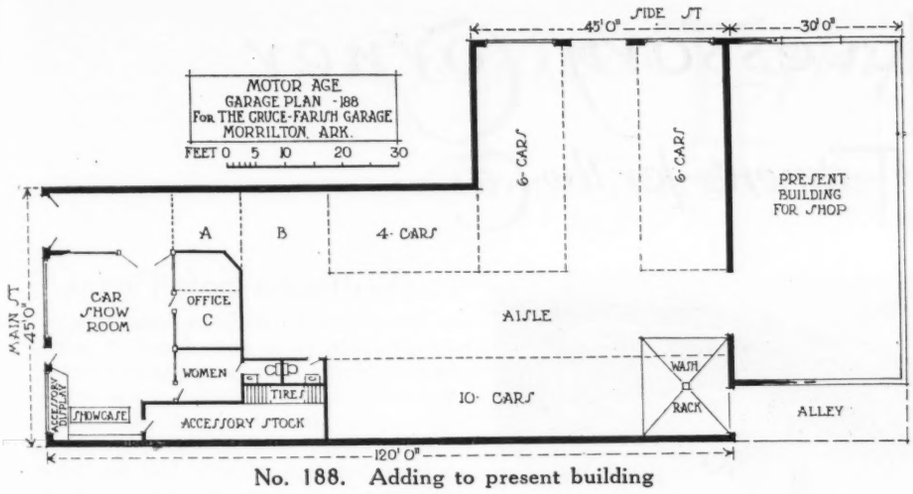
There may be objections to having the garage entrance around the corner from the salesroom, but many city concerns have their service stations blocks away from the salesrooms, and nearly all have no street entrance—only alley—so it can be done.

Do not have too many entrances and exits. Cut down the number as much as possible as entrances need aisles leading up to them and aisles are, to a great extent, waste space. One entrance and one exit are sufficient for the largest garage and there is no reason why a single opening is not enough for a place of this size.

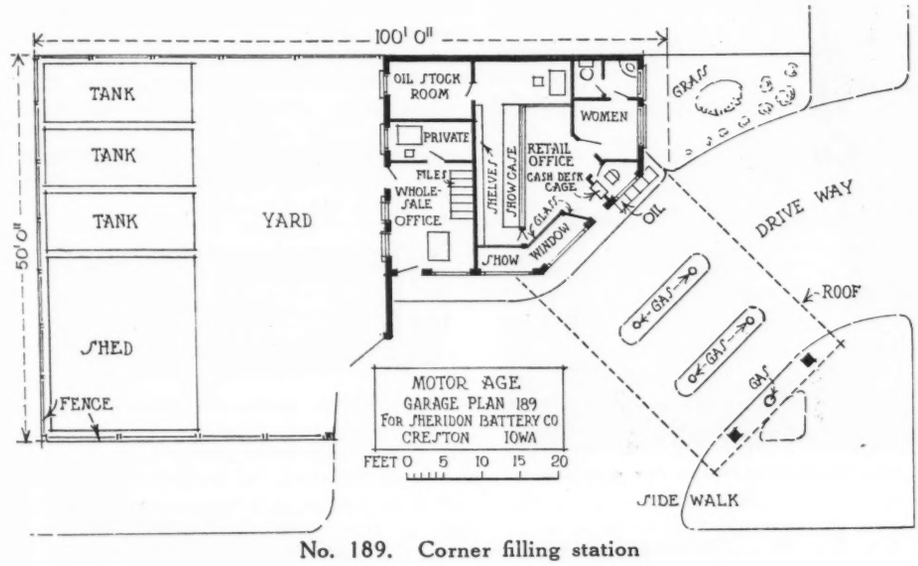
We have not attempted to locate the battery room as it is not important; either one of the four corners of the repair-shop would be all right.

No. 189
CORNER FILLING-STATION

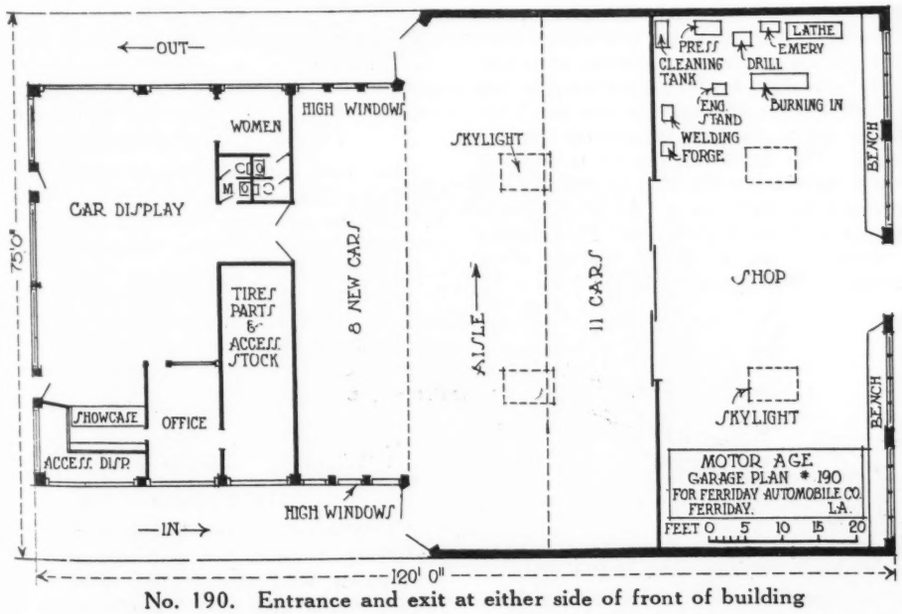
We are going to put in an oil service station in this town, about 10,000 inhabitants. We would like to have a woman's rest room, a trade office or an office to turn out the retail trade and then we would like to have a wholesale office entirely separate from this other office.



No. 188. Adding to present building



No. 189. Corner filling station



No. 190. Entrance and exit at either side of front of building

Now we want to put up a dandy, up-to-date in every respect, any suggestions from you will be greatly appreciated.—Sheridan Battery Co., Creston, Iowa.

You failed to give us any information regarding your lot so possibly we are in error in giving you a corner lay-out. However, the majority of filling-stations are on a corner, and a corner lot usually is considerably smaller than an inside lot.

The retail station occupies about half of the 50 by 100 lot, the wholesale department the balance. The main portion of the wholesale department is the yard containing the storage tanks, and shed or garage for the tank trucks.

The retail department has a small office, and store for the sale of canned oil and grease and possibly such accessories as grease-guns, spring-leaf spreaders, grease-cups, and, in fact, anything connected with or necessary to the oiling and greasing of a car. In front of the store and extending at an angle of 45 deg. toward the corner, is a wing or portico under which cars may find protection while being supplied with gasoline or oil.

No. 190

DETACHED BUILDING DESIRED

We would like a little help from you in the way of planning a garage. We own a lot which is 75 by 120 ft., in the center of a block, with alley at the back, and if possible we want to arrange a side-entrance, and use all the front for display. We would like about 25 ft. cut off clear across the front for display room; back of this a parts room 10 by 25, which would bring the parts room to the center of the building. Adjoining this a ladies' rest-room and toilet. This would leave room for a door to bring cars in from the back into the display room. Now this would leave us 85 ft. in the back for workshop and storage for new cars.

We forgot to state in the beginning that we figure on making the building 50 by 120, as we do not want to jam our building up against another, and we thought that we could set it away 10 ft. one side and 15 ft. the other, and make a driveway out of that 15 ft. side, which would be the right-hand side of the building.

We never will have over 12 new cars at a time and about 3 or 4 trucks. We carry about $3,500 in accessories and tires, and about $2,000 in parts. The building that we are now in we expect to use for storage for old cars and cars waiting for parts.

We expect to put in a filling-station, but will have no battery department or vulcanizing department. We are anxious to arrange this in order to get as much room as possible. If you can get an idea from this letter at about what we want, we would thank you for a suggestion.—Ferriday Automobile Co., Ferriday, La.

We see no reason for leaving the space on either side of your building, unless your location is in the residential section or you wish to follow the custom in your town of leaving a certain amount of space between buildings. No particular advantage would be gained as regards light, for with a one-story building better light would be obtained from above than from a side-window on a 10 or 15 ft. alley. We have used a 10-ft. driveway on each side—one in and one out. This will give you light and air around the front of the building; the back part will be the full width of the lot.

The space in front of the cross aisle is for new cars and will accommodate eight.

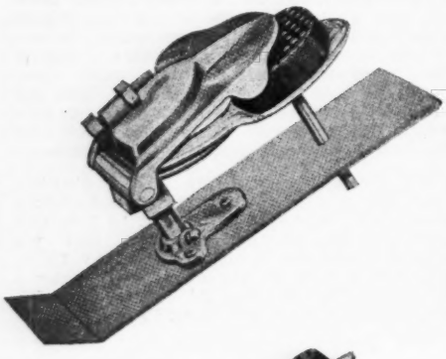
Nothing was said about an office. As we infer you overlooked that necessary evil. We have shown it, and so situated it that the office force can assist in accessory sales if necessary.

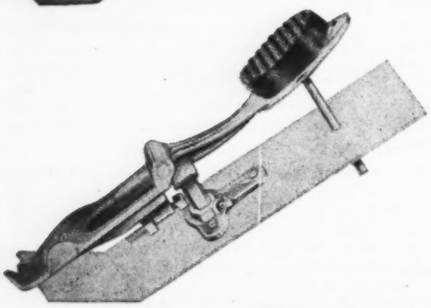
The Accessory Corner

New Fitments for the Car

Ford Brake Lining

A new brake lining has been introduced by the Wright Motor Specialties Co., 1326 Michigan Ave., Chicago, that is of the cork type, wherein the cork makes no direct contact with the brake drum. The strip of cork is sandwiched in between the layers of canvass, thus providing a cushioning effect that makes a soft and progressive engagement possible. Since the cork is not in direct contact with the brake-drum, it will naturally wear very long. This brake-band lining lists per set of three for $2.50.

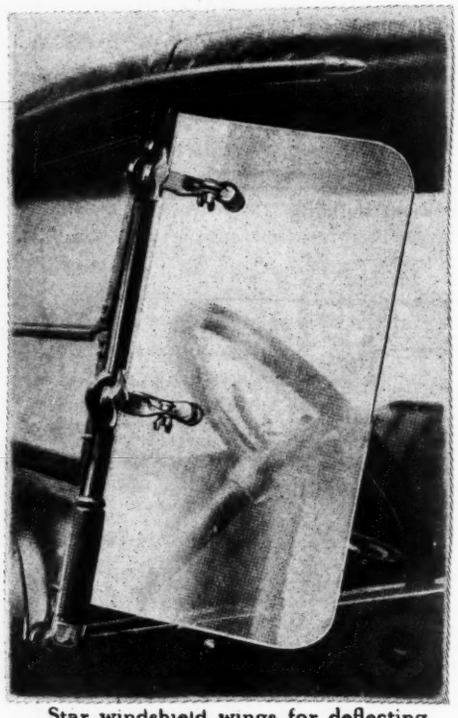




Two views of the Williams soft pedal. The upper view shows how it can be folded up to lift the floor boards

Star Windshield Wings

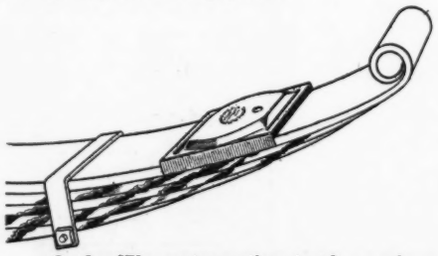
The Star Glass Wings manufactured by the Star Wing Co., Chicago, are not only very effective in deflecting the air, but add greatly to the attractive appearance of the car as well. They are attached to the windshield by hinged brackets, as shown in the illustration. There are no holes in the glass and it is thoroughly protected with rubber bushings which also eliminates rattles.



Star windshield wings for deflecting the wind

G. L. W. Spring Oiler

This is a spring oiler of the pad type that is snapped on over the upper spring leaf after which the oiler is supplied with oil from an oil can at periodic intervals. A strip of felt is held between the top of the oiler and the springs and two little clasps serve to hold the oiler to the spring. The spreading effect is secured by the capillary attraction of the oil as it squeezes its way out of the oiler to the springs with each flexation. This device is made by the G. L. W. Spring Oiler Company, San Diego, Cal.

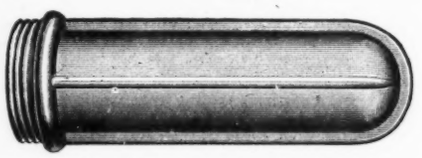


G. L. W. spring oiler is the pad type

Brake lining for Ford cars of the cork type. The strip of cork is in between the layers of canvas

Williams Soft Pedal

Did you ever make a long trip over rough roads when you found it almost impossible to keep a steady pressure on the accelerator, and find when you get out of the car that your leg muscles were cramped and aching from the unnatural position of your feet on the accelerator? Perhaps it was a hot day and the bottoms of your feet were pretty warm as well. The Williams Soft Pedal Co., Cedar Rapids, Ia., has a little device shown in the illustration which they claim will eliminate these annoying troubles. The pedal can be installed on any car and is built so that the heel rest folds out of the way if it is necessary to remove the floor boards.



Kwick on-an-off dust cap

"Jimmy" spring leaf spreader

New Dust Cap

This new dust-cap shown slips over the valve-stem and locks with one turn. It remains securely fastened onto the valve-stem until the time when it is necessary to remove it, when a slight turn in the other direction disengages it and permits its easy removal. The Kwick-On-an-Off dust-cap is manufactured by A. Schrader's Son, 783-791 Atlantic Ave., Brooklyn.

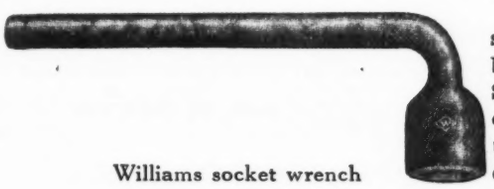
"Jimmy" Spring Leaf Spreader

The "Jimmy" Spring Leaf Spreader is especially devised for car owners and garagemen who realize the need of a simple, quick and easy way to oil their auto springs and still do the job thoroughly. This spreader operates so as to separate all the leaves of the spring at the same time, and permit the oiling of the springs through one inlet as shown in the illustration. The Thomas-Armstrong Co., 1777 Broadway, New York, is manufacturing this device with ten wedges which will spread eleven springs.

Service Equipment
Time Savers of the Shop

Swing Spout Oil Measure

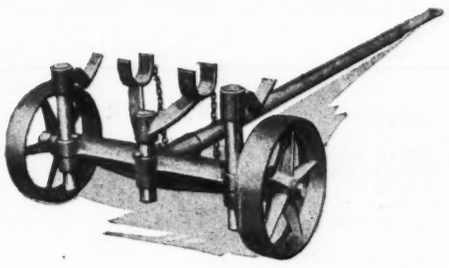
The swing spout oil measure is for use in the service station as an oil dispensing can. Its use eliminates the need of a funnel and a dripping oil can. The spout on this contrivance is fitted with a special ground valve that begins to open as the spout is turned downward and inserted in the opening of the crankcase filler cap. The can is made in two sizes for one and two quarts, one listing at $2.25 and the large size at $2.75. This can is manufactured by E. Edelmann & Co., Chicago.



Williams socket wrench

Williams Socket Wrench

Offset wrenches are a common enough piece of equipment in the service station and should be in every mechanic's tool box. The wrench is made by the J. H. Williams Co., of Brooklyn, are exceptionally sturdy and well balanced in their design. A great variety of wrenches can be had to meet and suit the requirements of every kind of nut. They are made for the S. A. E. standard nut and cap screw and can be had in unfinished, semi-finished or finished pattern. The style shown in the illustration is for hexagon openings only.



Mosher truck for bringing in disabled cars

Mosher Wrecking Truck

The motor wrecking truck which is shown in the illustration is what might be called a miniature wrecking truck. Special supports are incorporated in its construction that hold the front axle or the rear axle which ever the need may decide. The crane is very substantially made and is supported on roller bearings. The wheels are extremely wide and will not sink down into the ground on soft roads. The towing pole is telescopic and the front end has a swivel offset yoke that is provided with two heavy chains which may be secured to the springs or other convenient parts to prevent the possibility of side-slipping. By reversing this yoke the towing pole can be raised to a vertical position. The yoke is then pushed under the axle and by pushing the pole down to a horizontal position the truck rolls in on the axle enabling one man to lift the car quickly and easily. This device is made by the Mosher Mfg. Co., 12 E. 57th St., Chicago.

Boring and Burnishing Tool

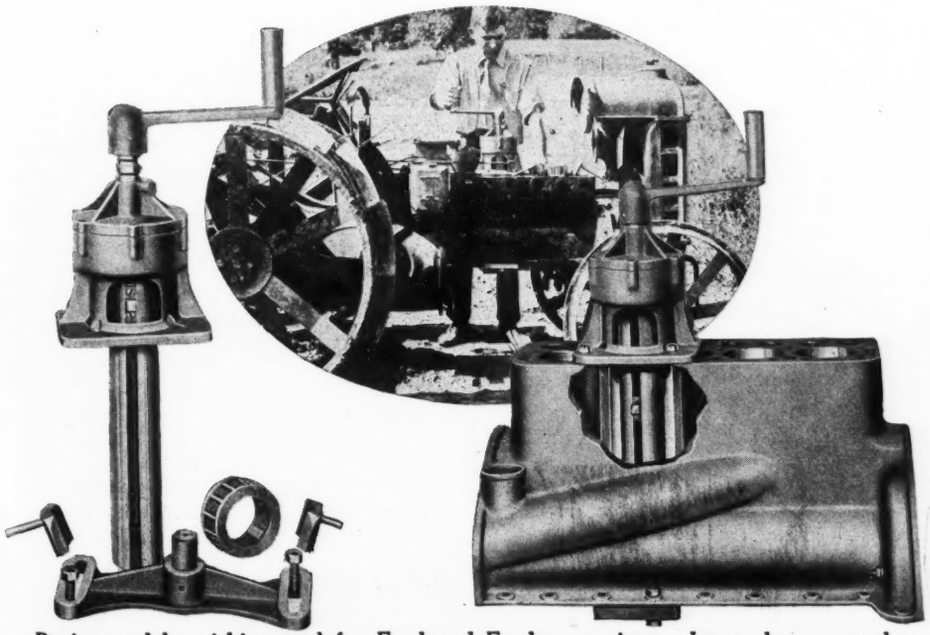
A boring and burnishing tool for Fordson tractor engines and Ford model T engines has recently been brought out, designed to take care of the needs of the garage and repair shops. The tool has been approved by the service departments of Henry Ford & Son and recommended to dealers handling Fordson tractors. It is manufactured by the Michigan Machine Co., Detroit.

The tool has three features. First, that it burnishes the cylinder after boring. Second, it is supported at top and bottom eliminating any chance of misalignment, and third, the location of the tool is held concentric by the use of gage blocks.

The tool is shown in the accompanying illustration and is operated by turning the crank, allowing the burnisher to run to the top of the cylinder and return to the bottom again by reversing the crank action. The burnishing tool consists of a series of rollers set between two collars provided with the necessary supports. The rollers are set at a slight angle which causes them to feed properly through the cylinder bore. The rollers float in the retaining collars which makes the tool self-aligning.

The boring tool has a single point cutter of high speed steel and is capable of boring 20 to 30 cylinders without regrinding. The tool can be operated by either hand or power. A crank is furnished for hand operation and a universal joint suitable for drill press for power operation.

Swing spout oil measure designed to eliminate the need of funnel



Boring and burnishing tool for Ford and Fordson engines. It can be operated by either hand or power

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 86

One of a series of weekly pages of information valuable to service men and dealers—save this page

HAL

Year	Model	Cyls.	Price	Serial Numbers
1916	12	12	$2100	Can be distinguished by straight windshields and carpet paneling on back of front seat
	12	12	2385	Introduced September, 1916. Can be recognized by walnut paneling on front seat back
1917	12	12	2600	A new pocket-style tire carrier is fitted
1918	25 Discontinued	12	$600	

HANSON

Year	Model	Cyls.	Price	Serial Numbers
1918	A-45	6	$1685	1001-1025
1919	A-45	6	1685	1026-1625
1920	.....	6	.....	1700 up Number on right side heel board under front seat; engine numbers left side crankcase

HARROUN

Year	Model	Cyls.	Price	Serial Numbers
1917	A-A-1	4	$695	101-549
1918	A-A-1	4	895	550-2381
1919	A-A-1	4	995	2382-2624 Number plate on right side front seat, under cushion

HATFIELD

Year	Model	Cyls.	Price	Serial Numbers
1919	A-42	4	.....	——— 678
1920	A-42	4	.....	700 up

HAYNES

Year	Model	Cyls.	Price	Serial Numbers
1912	A-21	4	$2100	3036-4851
	B-21	4	2450	
	C-21	4	2750	
	AY	4	3000	
	Y	4	3800–3900	
	22	4	2250–2750	
1913	22	4	3400–3500	
	23	6	2500	5000-6550
	24	4	1785	
	25	6	2700	
1914	26	6	2700–3200	
	27	6	2785–3830	6601-8499
	28	4	1985–2700	
1915	32	4	1660–2500	
	30	6	1485	
	31	6	2250–3000	8552-10949
	33	6	1550	
1916	34	6	1385	
	34	6	1485	
	35	6	1495	
	37	6	1725–2250	10951-15999
	36	6	1595–1750–2150	
	41	12	2225–2890	
	40	12	2095–2760	21000-24000
1917	36	6	1595–2260	16002 up
	37	6	1725–2390	
1918	38-39	6	2150-3250	29650 up
	44	12	2910-3985	21000-24000
1919–20	45	6	2685-4200	32894 up
	46	12	3450-4200	21364 up Number plate on cowl at extreme right; also on timing gear housing.

HOLLIER

Year	Model	Cyls.	Price	Serial Numbers
1915	158T	8	$985	1-580
	158R	8	985	1-60
1916	168T	8	985	580-623
1917	176T	6	1085	1-35
	176R	6	1085	1-35
	178R	8	1185	1-51
1918	186T	6	1185	6194-7010
	188T	8	1385	
1919	206T	6	1785	10001-10083
1920	206B	6	1985	10083 up Number on heel board of front seat

HOLMES

Year	Model	Cyls.	Price	Serial Numbers
1918	1	6	$2900	1-500
1919	2	6	2900	500 up
1920				20001 up Number plate on right rear frame

HOWARD—See Lexington

HUDSON

Year	Model	Cyls.	Price	Serial Numbers
1912	33	4	.....	15001-30000
1913	37	4	.....	30001-56500
1914	54	6	.....	56501-61700
	40	6	.....	63001-77201
1915	40	4	.....	73501-90000
	54	6	.....	59001-62000
1916	40	4	.....	G10001-G40000
1917	H	6	.....	H1-H99999
	J	6	.....	1-96499
	4J	6	.....	75000-97999
1918	M	6	.....	5000-97499
1919	O	6	.....	5000-90999
1920	O	6	.....	5000 up 27000 up 30000 up 49000 up 50000 up 59000 up 60000 up 61900 up 70000 up 81000 up 82000 up 84000 up 90000 up 91500 up

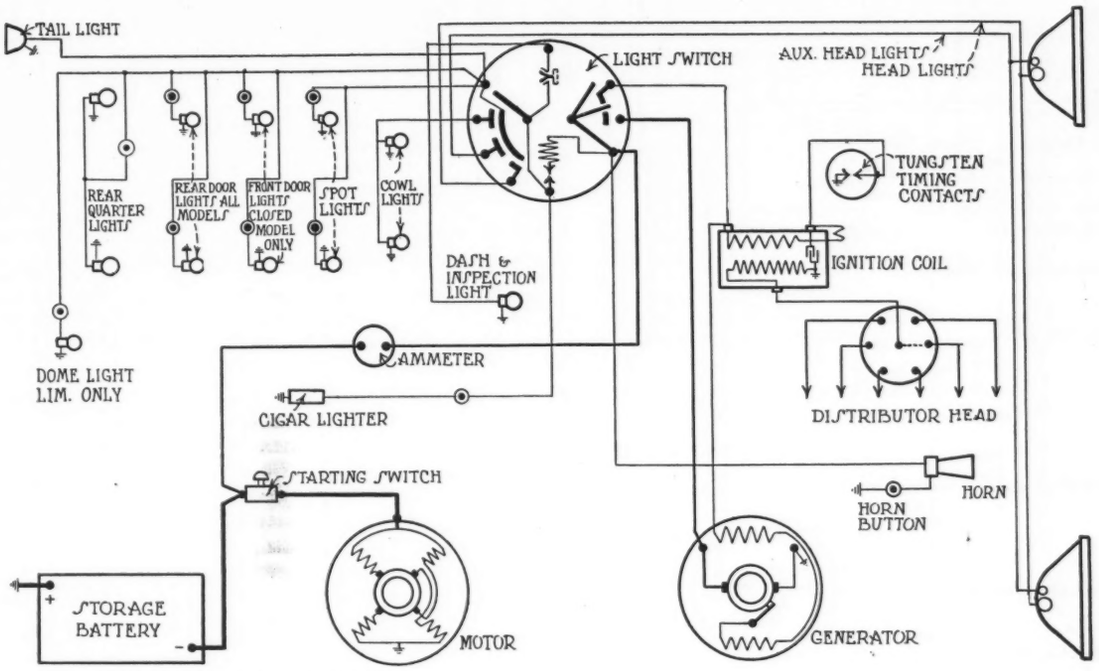
HUFFMAN

Year	Model	Cyls.	Price	Serial Numbers
1919	W	6	$1795	

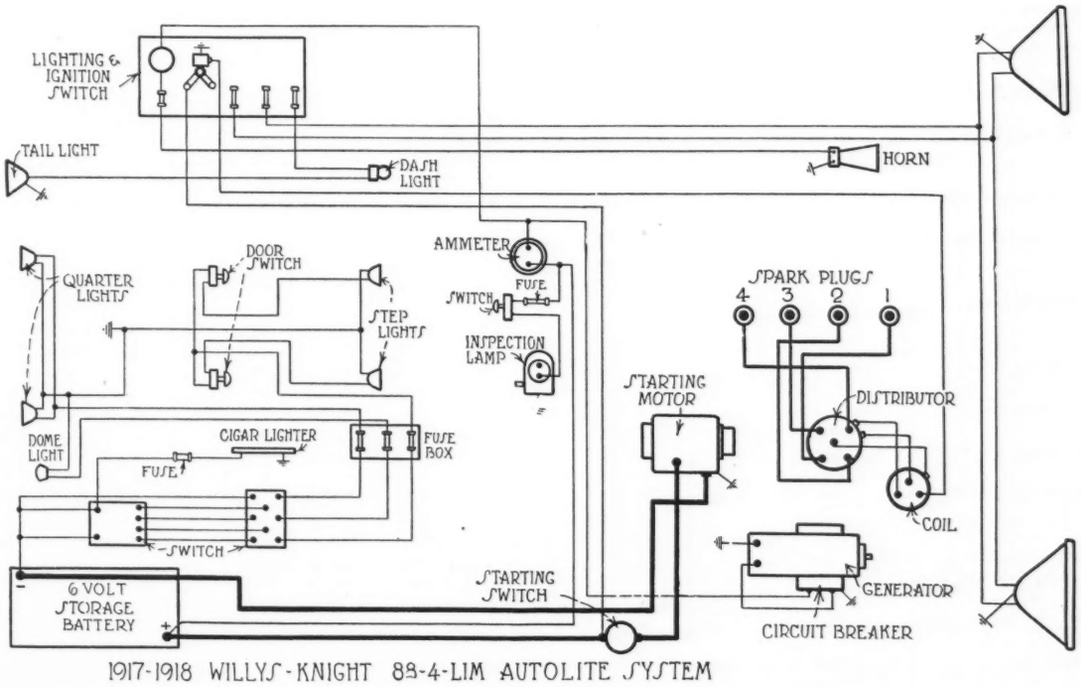
HUPMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1912	16-20	4	$750	25001-28902
	20	4	900	
1913	20	4	750	
	H	4	1000	
		4	1100	28903-40000
1914	H A	4	1200	
	32	4	1050	40001-52000 Number on sector plate center of dash
1915	K	4	1200	52001-60000
	N	4	1085	
1916	N	4	1185	
	N U	4	1340	
1917	N	4	1285	60000-87519
	N U	4	1440	
	N	4	1385	
	N U	4	1540	
				Number plate on dash near speedometer
1918	R	4	1250	
			1350	R1-R15000
			1350	
1919	R	4	1335	
	R3	4	1450	R20001 up Number plate on dash at steering column

Motor Age Weekly Wiring Chart No. 66



1920 PREMIER DELCO



1917-1918 WILLYS-KNIGHT 88-4-LIM AUTOLITE SYSTEM

THIS WEEK

1920 Premier—1917-1918 Willys-Knight

Allen—Dec. 18, '19
Auburn—Nov. 27, '19
Briscoe—Oct. 16, '19
Buick—Oct. 23, '19
Case—Oct. 2, '19
Crow-Elkhart—June 26, '19
Chalmers—Nov. 27, '19
Cutting—Nov. 6, '19
Daniels—Dec. 4, '19
Davis—Dec. 4, '19
Dorris—Dec. 11, '19
Empire—Oct. 30, '19
Essex—Oct. 23, '19
Ford—May 15, 22, '19
Franklin—June 19, '19; Dec. 11, '19
General Battery Charging—Sept. 25, '19
General Magneto Diagram—June 5, '19
Haynes—Oct. 9, '19
Hupmobile—Oct. 16, '19
Internal Connections—July 10-17-24, '19
Keeton—Nov. 6, '19
King—July 3, '19
Kissel—July 3, '19
Lexington—Jan. 1, '20
Liberty—Jan. 1, '20
Marmon—Dec. 25, '19; Jan. 22, '20
Maxwell—Aug. 14, '19
Mercer—Aug. 28, '19; Nov. 27, '19
Mitchell—Jan. 8, '20
Monroe—Oct. 30, '19
Moon—Jan. 29, '20
National—June 19, '19; Feb. 12, '20
Oakland—Oct. 16, '19
Olympian—Jan. 22, '20
Owen Magnetic—Sept. 18, '19
Packard—June 19, '19 ;July 31, '19
Paige—July 3, '19
Paterson—June 26, '19; July 3, '19
Pierce-Arrow—Oct. 2, '19; Feb. 5, '20
Reo—Aug. 21, '19; Oct. 9, '19; Nov. 13, '19
Scripps-Booth—Jan. 25, '20
Stanley—June 26, '19
Stearns-Knight—Jan. 8, '20
Stephens—Feb. 12, '20
Studebaker—Dec. 25, '19
Stutz—Feb. 5, '20
Templar—Jan. 29, '20
Velie—Sept. 25, '19; Feb. 19, '20
Westcott—Jan. 15, '20
White—Sept. 25, '19; Feb. 19, '20
Special Systems for Fords—May 15-22, '19

Motor Age Monthly Guide to Tractors

These tables are revised and brought up to date monthly

Line No.	Manufacturer	Tractor and Model	Drawbar horse power	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.
1		Oil Pull	12	20	3	22 x 36	2150	6682	.....	Wh.	51	Own	2 Hor.	6 x 8	560
2	Advance-Rumely Thresher Co., Laporte, Ind.	Oil Pull	16	30	4	28 x 44	2850	9600	.....	Wh.	56	Own	2 Hor.	7 x 8½	530
3		Oil Pull	20	40	5-6	32 x 52	3750	12820	.....	Wh.	64	Own	2 Hor.	8 x 10	450
4		Oil Pull	30	60	8-10	36 x 60	5900	26700	.....	Wh.	80	Own	2 Hor.	10 x 12	375
5	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Allis-Chalmers, 18-30	18	30	3-4	.....	3000	6000	$1,785	Wh.	50	Own	4 Ver.	4¾ x 6½	830
6	Appleton Mfg. Co., Batavia, Ill.	Appleton	12	20	2-3	22	2000	4900	1,650	Wh.	54	Buda	4 Ver.	4¼ x 5½	1009
7		Aultman-Taylor	15	30	4	28	2800	7500	2,300	Wh.	70	Clim.	.....	5 x 6½	900
8	Aultman-Taylor Machinery Co., Mansfield, O.											Wauk.	4 Ver.	4¾ x 6¾	
9		Aultman-Taylor	22	45	6	32	4800	13000	3,700	Wh.	70	Own	4 Hor.	5⅛ x 8	600
10		Aultman-Taylor	30	60	8-12	.....	8000	23000	4,800	Wh.	90	Own	4 Hor.	7 x 9	500
11	Automotive Corp., Toledo, Ohio	Automotive, B-B	12	25	2	30	1800	.....	.....	Wh.	40	Herc.	4 Ver.	4 x 5⅛	1000
12															
13															
14		Avery, 8-16	8	16	2-3	22 x 32	1800	4900	.....	Wh.	50	Own	2 Hor.	5½ x 6	600-700
15															
16		Avery, 12-25	12	25	3-4	20 x 30	2800	7500	.....	Wh.	56	Own	2 Hor.	6½ x 7	600-700
17		Avery, 14-28	14	28	3-4	24 x 36	3000	6800	.....	Wh.	60	Own	4 Hor.	4⅝ x 7	600-800
18	Avery Co., Peoria, Ill.	Avery, 18-36	18	36	4-5	24 x 36 / 28 x 46	3500	9250	.....	Wh.	65	Own	4 Hor.	5½ x 6	650-750
19															
20		Avery, 25-50	25	50	5-6	28 x 46 / 32 x 54	4800	12500	.....	Wh.	69	Own	4 Hor.	6½ x 7	600-700
21															
22		Avery, 40-80	40	80	8-10	36 x 60	7600	22000	.....	Wh.	87½	Own	4 Hor.	7¾ x 8	500-600
23	Bates Mach. & Trac. Co., Joliet, Ill.	Steel Mule	15	22	3	26-36	.....	4600	.....	Cr.	.....	Erd	4 Ver.	4¼ x 6	900
24															
25		Tracklayer, B	12	25	3	.....	2000	5100	2,600	Cr.	.....	Own	4 Ver.	4⅜ x 5¼	850
26	C. L. Best Gas Trac. Co., San Leandro, Calif.														
27		Tracklayer, A	35	60	9	.....	6500	17500	5,750	Cr.	.....	Own	4 Ver.	6½ x 3½	650
28															
29	Buckeye Mfg. Co., Anderson, Ind.	Trundaar, 10	25	40	4	.....	3750	8800	3,750	Ch. T.	.....	Wauk.	4 Ver.	5 x 6¼	900
30	Bull Tractor Co., Anderson, Ind.	Bull	12	24	2-3	26	1000	4996	1,200	.....	60	Toro	2 Hor.	5½ x 7	750
31	Burn-Oil Tractor Co., Peoria, Ill.	Burn-Oil, A	15	30	3	26	.....	5500	1,550	.....	56	Own	2 Hor.	6¾ x 7	700
32															
33	J. I. Case Plow Works Co., Racine, Wis.	Wallis, K	15	25	3	.....	2000	3560	.....	Wh.	48	Own	4 Ver.	4¼ x 5¾	850
34		Case, 10-18	10	18	2	20 x 28	1665	3400	1,200	Wh.	42	Own	4 Ver.	3⅞ x 5	1050
35	J. I. Case T. M. Co., Racine, Wis.	Case, 15-27	15	27	3	20 x 36	2500	5750	1,600	Wh.	52	Own	4 Ver.	4½ x 6	900
36		Case, 22-40	22	40	4-6	26 x 46	3428	9500	2,600	Wh.	56	Own	4 Ver.	5½ x 6¾	850
37															
38	Cleveland Trac. Co., Cleveland, Ohio.	Cletrac, H	12	20	2	24-40	1285	3300	1,585	Cr.	.....	Own	4 Ver.	3¾ x 5½	1265
39															
40	Dart Truck & Trac. Corp., Waterloo, Ia.	Blue J, T. E	12	25	3	24	2250	4300	1,850	Wh.	42	Buda	4 Ver.	4¼ x 5½	1050
41		Blue J	15	30	3-4	28	2500	4500	2,000	Wh.	42	Buda	4 Ver.	4½ x 6	1050
42		Sandusky J	10	20	3	22	2000	4080	1,850	Wh.	48	Own	4 Ver.	4¼ x 5¼	1050
43	Dauch Mfg. Co., Sandusky, Ohio														
44		Sandusky, E	15	35	4	30	3500	7670	2,500	Wh.	56	Own	4 Ver.	5 x 6½	750
45		Leader, B	12	24	2	20	2000	5200	1,285	.....	48	Own	2 Hor.	6¼ x 6	800
46	Dayton-Dowd Co., Quincy, Ill.	Leader, C	18	36	3-4	28	4000	6500	2,495	Cr.	.....	Twin	4 Ver.	5 x 7½	750
47		Leader, CX	20	40	4-5	28	5000	6500	2,750	Cr.	.....	Doman	4 Ver.	6 x 7	750
48	Eagle Mfg. Co., Appleton, Wis.	Eagle, F	12	22	2-3	24	2400	5850	1,290	Wh.	48	Own	2 Hor.	7 x 8	450
49		Eagle, F	16	30	3-4	28-30	3200	7100	1,750	Wh.	52	Own	2 Hor.	8 x 8	450
50	Electric Wheel Co., Quincy, Ill.	Allwork, C	14	28	3	28	3000	5000	.....	Wh.	48	Own	4 Ver.	5 x 6	800
51		E-B, Q	12	20	3	24	2000	6500	.....	Wh.	60	Own	4 Ver.	4¾ x 5	850
52	Emerson, Brantingham Co., Rockford, Ill.	E-B, 12-20, AA	12	20	3	24	2600	4355	.....	Wh.	54	Own	4 Ver.	4¾ x 5	900
53		E-B, 20-35	20	35	5	28	3300	9700	.....	Wh.	72	Own	4 Ver.	5¼ x 7	750
54		E-B, Reeves	40	65	8-10	44	10000	22750	.....	Wh.	90	Spec.	4 Ver.	7¼ x 9	500
55	Fageol Motors Co., Oakland, Calif.	Fageol, D	9	12	2	.....	1450	3500	1,525	.....	48	Lyc.	4 Ver.	3½ x 5	1250
56	Ford & Son, Inc., Henry, Dearborn, Mich.	Fordson	....	20	2	20-34	1800	2750	750	Wh.	42	Own	4 Ver.	4 x 5	1000
57															
58	Four-Drive Trac. Co., Big Rapids, Mich.	Fitch, 4	20	35	3-4	28-30	3200	6000	3,000	Wh.	F- 36x12 / R- 42x12	Clim.	4 Ver.	5 x 6½	850
59															
60	Frick Co., Waynesboro, Pa.	Frick	12	24	3	22-26	.....	5800	.....	Wh.	60	Erd.	4 Ver.	4 x 6	900-1000
61		Frick	15	30	3-4	26	.....	6000	.....	Wh.	60	Beaver	4 Ver.	4¾ x 6	900-1000
62	General Ordnance Co., Cedar Rapids, Ia.	G-O	14	28	8	30	.....	4200	1,485	Wh.	46	Wauk.	4 Ver.	4 ½ x5¾	1000
63	Gray Tractor Co., Minneapolis, Minn.	Gray	18	36	4	.....	2700	6185	.....	.....	54	Wauk.	4 Ver.	4¾ x 6¾	850
64	Hart-Parr Co., Charles City, Ia.	Hart-Parr, 30	....	30	3	28	3000	5570	1,395	Wh.	52	Own	2 Hor.	6½ x 7	750
65															
66	Holt Mfg. Co., Peoria, Ill.	Caterpillar, 5-Ton	25	40	4	32-52	3100	9400	.....	Cr.	.....	Own	4 Ver.	4¾ x 6	1050
67		Caterpillar, 10-Ton	40	60	6	40-60	5000	19000	.....	Cr.	.....	Own	4 Ver.	6½ x 7	700
68	Huber Mfg. Co., Marion, Ohio	Huber, 12-25	12	25	3	24 x 42	2400	5000	.....	Wh.	60	Wauk.	4 Ver.	4½ x 5¾	1000
69	Illinois Tractor Co., Bloomington, Ill.	Illinois, C	18	30	4	24-28	3500	5200	2,375	Wh.	54	Clim.	4 Ver.	5 x 6½	800
70		International	8	16	2	.....	1350	3600	.....	Wh.	40	Own	4 Ver.	4¼ x 5	1000
71	International Harvester Co., Chicago.	Titan	10	20	3	.....	1800	5710	.....	Wh.	54	Own	2 Hor.	6½ x 8	575
72		International	15	30	4	.....	2500	8990	.....	Wh.	66	Own	4 Hor.	5¼ x 8	575
73	J. T. Tractor Co., Cleveland, Ohio	J. T., N	16	40	3	30	3200	6500	2,800	Cr.	.....	Chief	4 Ver.	4¾ x 6	1000
74	Kardell Trac. & Tr. Co., St. Louis, Mo.	Kardell Utility	10	20	2	.....	.....	3500	.....	.....	.....	Wis.	4 Ver.	4 x 5	.....

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carburetor**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Cr., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K, Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

and Their Technical Specifications

Tractor specifications appear the last issue of each month

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
1	K-D	2¼-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Own	Hyatt	19	500	2790	2	2.1-3.26	2.1	B. G.	Op.	No	1
2	K-D	2½-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Own	Hyatt	23	530	3190	2	2.1-3	2.1	G. B.	Op.	No	2
3	K-D	2¾-Own	Donal.	Bosch	Own	Own	Sl. G.	Own	Own	Own	Hyatt	26	450	3060	2	2-3.2	2	B. G.	Op.	No	3
4	K-D	3¼-Own	None	Bosch	Own	Own	Sl. G.	Own	Own	Own	Own	36	375	3540	1	1.9	1.9	B. G.	Op.	No	4
5	G-K	1½-King	Ben.	Opt.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	15	830	3200	2	2.3-2.8	2.8	.....	.....	Yes	5
6	G-K	1¼-Scheb.	Ben.	Bosch	B. & B.	Nutt	Sl. G.	Perfex	Hyatt	Own	Hyatt	7½	825	2600	2	2¼-3½	.....	I. G.	.....	Yes	6
7	G-K-D	1⅜-King.	Ben.	Eise.	Own	Own	Sl. G.	Hooven	Hyatt	Own	Hyatt	20	450	2400	1	2.2-2.49	2.5	I. G.	.....	Yes	7
8																					8
9	G-K-D	2 -King.	.....	Eise.	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150	.....	1-2.93	2.13	B. G.	.....	No	9
10	G-K-D	2½-King.	.....	Eise.	Own	Own	.....	Own	Own	Own	Own	24	500	3150	2.2	1-2.2	2.2	B. G.	.....	No	10
11	G-K	1⅛-King.	Ben.	Eise.	B. & B.	Own	Sl. G.	McCord	U. S. Gurney Hyatt	Timk.	Timk.	10	996	2600	2	2¼-4	2¼	I. G.	In.	Yes	11
12																					12
13																					13
14	G-K	1¼-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	17½	600	2750	2	1¾-3	1¾	S. G.	Op.	.....	14
15	D-A																				15
16	G-K-D	1½-King.	.....	K-W	Own	Own	C. M	Own	.....	Own	Own	19½	570	2910	2	1¾-2¾	1¾	S. G.	Op.	.....	16
17	G-K-D	1¼-King.	.....	K-W	Own	Own	C. M.	Own	.....	.....	Own	16	700	2930	2	2⅛-3½	2	S. G.	Op.	.....	17
18	G-K-D	1½-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	18	650	3065	2	2-3	2	S. G.	Op.	.....	18
19																					19
20	G-K-D	2-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	22	500	2880	2	2-3	2	S. G.	Op.	.....	20
21																					21
22	G-K-D	2-King.	.....	K-W	Own	Own	C. M.	Own	.....	Own	Own	26	500	3400	2	1¾-2⅔	1¾	S. G.	Op.	.....	22
23	G-K-D	1¼-Ben.	Ben.	Dixie	B. & B.	Own	Sl. G.	Modine	Timk.	Timk.	T. & H.	12	725	2300	2	2.33-3.5	2.33	S. G.	.....	.....	23
24																					24
25	D	1½-Ens.	Ben.	Split.	Own	Own	Sl. G.	Own	Hyatt Timk.	.....	Hyatt	9	9000	1971	2	2¼-3	3	I. G.	.....	.....	25
26																					26
27	D	2-Ens.	Ben.	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.	.....	Timk.	16	650	2720	2	3-2	3	I. G.	.....	.....	27
28																					28
29	G-K-D	-Strom.	Own	Bosch	Hill.	Own	Sl. G.	Modine	Opt.	.....	H. & T.	....	900	2600	2	1.3-2.5	.....	S. G.	In.	.....	29
30	G-K-D	1½-King.	Donald.	K-W	.....	.....	.....	.....	.....	.....	Hyatt	12	750	.....	1	2.4-2¾	2.4	B. G.	.....	.....	30
31	K	1½-Scheb.	Ben.	K-W	Own	Own	.....	Spec.	S. K. F Hyatt	Hyatt	Hyatt	13	750	750	2	1¾-3	2¾	G.	.....	.....	31
32																					32
33	G-K-D	1¼-Ben.	Ben.	Bosch	Twin	Own	Sl. G.	Modine	Timk.	Hyatt	Timk.	18	430	.....	2	1½-3½	2½	S. G.	.....	.....	33
34	K	1⅛-King.	Own	King.	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	14¼	1050	3916	2	2¼-3½	2¼	S. G.	In.	No	34
35	K	1⅜-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Hyatt	16	900	3762	2	2¼-3½	2¼	S. G.	In.	No	35
36	K	2-King.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt Timk.	Timk.	Hyatt	16½	850	3669	2	1.2-3.2	2.2	S. G.	In.	No	36
37																					37
38	G-K-D	1-King.	Own	Eise. Teagle	Own	Own	.....	McCord	.....	.....	.....	8	1265	2500	1	1-3½	3½	I. G.	.....	.....	38
39																					39
40	G	1¼-King.	R. W.	Split.	Delt.	Own	Sel.	Own	Gurney	Timk.	Timk.	12	710	2600	3	1¼-6	2½	B. G.	In.	Yes	40
41	G	1¼-King.	R. W.	Split.	Delt.	Own	Sel.	Own	Gurney	Timk.	Timk.	12	710	2600	3	1¼-6	2½	B. G.	In.	Yes	41
42	G-K-D	1¼-King.	Ben.	Dixie	Own	Own	Sel.	Perfex	Hyatt N. D.	Own	Own	10	1000	2600	2	2-3	2	I. G.	.....	Yes	42
43																					43
44	G-K-D	2 -King.	Ben.	Dixie	Own	Own	Sel.	C. & P.	Own	Own	Own	15	800	2950	3	2-5½	2	I. G.	.....	No	44
45	K	1½-King.	Own	King.	Own	Own	Sel.	Eureka	Own	Own	Own	14	800	2800	2	2¼-3½	2¼	I. G.	Op.	.....	45
46	K-D	1¾-King.	Ben.	K-W	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2½	1.8	Ch.	Op.	.....	46
47	G-K-D	1½-Holl.	Ben.	Dixie	Own	Own	Sel.	Eureka	Own	Own	Own	14	750	2700	2	1.8-2½	1.8	Ch.	Op.	.....	47
48	G-K	1½-Linga	Own	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	20	450	2350	2-3	1½	2	G.	.....	Yes	48
49	G-K	2 -Linga	Own	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Own	Own	24	450	2827	2-3	1½	2	G.	.....	Yes	49
50	K	1½-King.	Ben.	King.	Own	Own	Sl. G.	Perfex	Hyatt	.....	.....	13½	800	2500	3	1⅞-3¾	2½	B. G.	.....	.....	50
51	K	1½-Ben.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Own	Own	Own	12	800	2225	3		.....	B. G.	Op.	Yes	51
52	K	1½-Strom.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt	.....	.....	12	900	2800	2	2.01-2.78	.....	I. G.	In.	No	52
53	K	1½-Ben.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	597	2500	2	1.81-2.33	.....	G.	Op.	No	53
54	K	2½-King.	Ben.	K-W	Own	Own	Sl. G.	Perfex	Hyatt	Own	Hyatt	22	500	2880	1	1⅞-3.75	.....	G.	Op.	.....	54
55	G-K-D	1 -Zen.	Own	Dixie	Own	Own	C. M.	Modine	Timk.	Timk.	Timk.	8	1250	2600	1	¾-3	2⅓	S. G.	.....	.....	55
56	K	-Own	Own	Own	Own	Own	C. M.	Own	Gurney S. R. B.	Timk.	Gurney S. R. B.	9½	1000	2480	3	1-8	2¾	Worm	In.	.....	56
57																					57
58	K	1½-King.	Ben.	Dixie	B. & B.	Cotta	Ind. Cl.	Spirex	Timk.	Timk.	Timk.	14	650	2275	3	¾-4	2½	F. Bevel R. Worm	.....	No	58
59																					59
60	K	-King.	Ben.	King.	Own	Nutt.	S.	Perfex	Hyatt	Own	Own	13	900	3060	2	2.3-3.8	2½	S. G.	.....	Yes	60
61	K	-Ben.	Ben.	Dixie	Own	Nutt.	S.	Perfex	Hyatt	Own	Own	13	900	3060	2	2.3-3.8	2½	S. G.	.....	Yes	61
62	G-K	1¼-King.	Ben.	Eise.	.....	Own	C. M.	Perfex	S. K. F.	.....	.....	10	970	.....	6	1¾-3	2½	S. G.	In.	No	62
63	K	1½-Ben.	Ben.	.....	Own	Own	.....	S-J	Hyatt	.....	Hyatt	11⅜	850	2900	2	2½	2¾	Ch.	In.	Yes	63
64	K	K-Shunt	Own	K-W	Own	Own	Sl. G.	S-J	S. K. F. Hyatt	Own	.....	14	750	2750	2	2.4-3.5-2.3	3	I. G.	Op.	Yes	64
65																					65
66	G	1½-Scheb.	Donald.	Eise.	Own	Own	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	12	1012	3150	3	1.5-5.7	3	G.	In.	No	66
67	G	2 -King.	Donald.	K-W	Own	Own	Sl. G.	Own	Hyatt	Hyatt	Hyatt	14	850	3120	3	1.65-4.78	3	G.	In.	No	67
68	G-K	¼-King.	Ben.	King.	Own	Own	Sel.	Perfex	G. & H.	Own	Own	13	1000	.....	2	2.43-3.75	2.43	S. G.	Op.	Yes	68
69	K	1½-Strom.	Ben.	Dixie	Twin	Foote	Sl. G.	Modine	Hyatt	Hyatt	Hyatt	14	600	2400	2	2½-3.4	2½	S. G.	In.	Yes	69
70	G-K-D	-Ens.	.....	Dixie	Own	.....	Sl. G.	B. & L.	Own	Own	.....	12¼	625	.....	.....	1¾-4.1	2⅓	Ch.	.....	.....	70
71	G-K-D	-Own	.....	K-W	Own	.....	Sl. G.	.....	Own	Own	.....	18	575	.....	.....	2¼-2⅔	2⅓	Ch.	.....	.....	71
72	G-K-D	-Own	.....	K-W	Own	.....	Sl. G.	.....	Own	Own	.....	18	575	.....	.....	2¼-2⅞	2⅞	Ch.	.....	.....	72
73	K	1½-Own	Ben.	K-W	Own	Covert	Sel.	McCord	Timk.	Hyatt	Hyatt	10	1000	2600	3	1¼-5	2½	I. G.	In.	No	73
74	G	1 -Carter	Ben.	Dixie	.....	.....	.....	Eureka	.....	.....	.....	.....	800	.....	2	.....	.....	.....	.....	.....	74

Abbreviations. **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carburetor**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tollotson; Zen., Zenith; Cr., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K, Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final Drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

Motor Age Monthly Guide to Tractors

These tables are revised and brought up to date monthly

Line No.	Manufacturer	Tractor and Model	Drawbar horse power	Belt horsepower	Number plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	No. and type of cylinder	Bore and stroke	Normal R. P. M.
75	Keck Gonnerman Co., Mt. Vernon, Ind.	Keck-Gonnerman, B.	12	24	3	24 x 40	2500	6500	1,500	Wh.	60	Own	2 Hor.	7¼ x 8	7 0
76		Flour City, Jr.	14	24	3	24					60	Own	4 Ver.	5 x 5	800
77	Kinnard & Sons Mfg Co., Minneapolis, Minn.	Flour City	20	35	4-5	28		10000			72	Own	4 Ver.	5¼ x 6	800
78		Flour City	30	50	6-8	30		14000			84	Own	4 Ver.	6¼ x 7	550-600
79		Flour City	40	70	8-10	36		21000			96	Own	4 Ver.	7½ x 9	450-500
80	La Crosse Trac. Co., La Crosse, Wis.	La Crosse, G.	12	24	3	22	2000	4000	875	Wh.	56	Own	2 Hor.	6 x 7	750
81	Lauson, John, Mfg. Co., New Holstein, Wis.	Full Jewel	15	30	3-4	24-30	3000	6500	2,150	Wh.	54	Beav.	4 Ver.	4¾ x 6	950
82	Liberty Tractor Co., Minneapolis, Minn.	Liberty	18	32	4	30	3380	5900	2,475	Wh.	48	Clim.	4 Ver.	5 x 6½	850
83		Twin City, 12-20	12	20	3	20-24	2000	4200		Wh.	50	Own	4 Ver.	4½ x 6	1000
84		Twin City, 16-30	16	30	4	24-28	3000	7800		Wh.	54	Own	4 Ver.	5 x 7½	650
85	Minneapolis Steel & Machinery Co., Minneapolis	Twin City, 25-45	25	45	6	32-34	6700	16000		Wh.	76	Own	4 Ver.	6¼ x 8	600
86	Minn.	Twin City, 40-65	40	65	8	40	7500	23700		Wh.	84	Own	4 Ver.	7¼ x 9	535
87		Twin City, 60-90	60	90	12	40	11250	2800		Wh.	84	Own	6 Ver.	7¼ x 9	535
88	Moline Plow Co., Moline, Ill.	Universal D	9	18	2	22	2100	3380	1,500	Wh.	52	Own	4 Ver.	3½ x 5	1650
89	Nichols & Shepard Co., Battle Creek, Mich.	Oil-Gas, 25-50	25	50	6	25-32x52		19000		Wh.	28	Own	2 Hor.	9 x 12	350-425
90		Oil-Gas, 35-70	35	70	8-10	52-64		30000		Wh.	32	Own	2 Hor.	10½ x 4	300-375
91	Parrett Tractor Co., Chicago Heights, Ill.	Parrett, H.	12	25	3		2800	5225		Wh.	60	Buda	4 Ver.	4¼ x 5½	1000
92	Peoria Tractor Corp., Peoria, Ill.	Peoria, J	12	25	3	26	3000	5100	1,985	Wh.	56	Clim.	4 Ver.	5 x 6½	800
93	Pioneer Tractor Co., Winona, Minn.	Pioneer, 18-36	18	36	4	28	4000	6100			60	Own	4 Ver.	5½ x 6	750
94		Pioneer, 30	30	60	10	36	8000	24000			96	Own	4 Ver.	7 x 8	650
95	Plow Man Tractor Co., Waterloo, Ia.	Plow Man, 15-30	15	30	3-4	30	3000	5100	1,895	Wh.	60	Buda	4 Ver.	4½ x 6	1000
96	Pope Mfg. Co., Watertown, S. D.	Dakota, 4	15	27	3	24	2000	5700	1,750	Wh.	42	Doman	4 Ver.	4¾ x 6	800
97	Post Trac. Co., Cleveland	Post, D	12	20	2			4300		Wh.	32	Wauk.	4 Ver.	4¼ x 5¾	800
98	Pt. Huron Eng. & T. Co., Pt. Huron, Mich.	Port Huron, 12-25	12	25	3	22-38	2200	5900		Wh.	56	Chief	4 Ver.	4¾ x 6	900
99															
100	Reed Fdy. & Mach. Co., Kalamazoo, Mich.	One-Man	12	25	3	22-24		5000	1,685	Wh.	60	Wauk.	4 Ver.	4½ x 5¾	1000
101	Rock Island Plow Co., Rock Island, Ill.	Heider, D	9	16	2	20	1500	4000		Wh.	57	Wauk.	4 Ver.	4¼ x 5¾	800
102		Heider, C	12	20	3	24	2000	6000			57	Wauk.	4 Ver.	4½ x 6¾	750
103		Russell Junior	12	24	2	18	2000	6200		2 Wh.	53	Wauk.	4 Ver.	4½ x 5¾	1000
104	Russell & Co., Massillon, Ohio.	Russell Little Boss	15	30	3	24	3000	6900		2 Wh.	53	Wauk.	4 Ver.	4½ x 6¾	950
105		Russell Big Boss	20	35	4	30	4000	7600		2 Wh.	60	Model	4 Ver.	5½ x 7	825
106		Russell Giant	30	60	8	40	8	24000		2 Wh.	84	Own	4 Ver.	8 x 10	525
107	Shelby Trac. & Tr. Co., Shelby, O.	Shelby, C	9	18	2	20	2000	3500		Wh.	42	Wauk.	4 Ver.	3¾ x 5¼	1000
108	Short Turn Tractor Co., Minneapolis, Minn.	Short Turn, D.	20	40	3	24		5000	1,500	Wh.	65		4 Ver.	4¾ x 6	950
109															
110															
111	Square Turn Tractor Co., Norfolk, Nebr.	Square Turn, A.	18	35	3	28	3200	7400	1,875		60	Clim.	4 Ver.	5 x 6½	850
112	Stinson Trac. Co., Superior, Wis.	Stinson, 4-E	18	36	4	28-30		7100		Wh.	60	Beav.	4 Ver.	4¾ x 6	950
113	Topp-Stewart Trac. Co., Clintonville, Wis.	Topp-Stewart, B	20	35	3-5		5000	7500	3,000	Wh.	42	Wauk.	4 Ver.	4¾ x 6¾	900
114	Turner Mfg. Co., Pt. Washington, Wis.	Simplicity	14	25	3	24	2600	4300	1,540	Wh.	54	Buda	4 Ver.	4¼ x 5½	1000
115	U. S. Trac. & Machy. Co., Menasha, Wis.	Uncle Sam, B-19	20	30	3	28	3000	4250			50	Beav.	4 Ver.	4¾ x 6	900
116	Vim Tractor Co., Schleisingerville, Wis.	Vim	10	20	2	20	1800	3200	1,485	Wh.	48	Wauk.	4 Ver.	3¾ x 5¼	1000
117	Waterloo Gasoline Eng. Co., Waterloo, Ia.	Waterloo Boy, N.	12	25	3		2000	5900		Wh.	52	Own	2 Hor.	6½ x 7	750
118	Wetmore, H. A., Sioux City, Ia.	Wetmore	12	25	2	22		2900	1,485	Wh.	46	Wauk.	4 Ver.	4 x 5¾	960
119	Wisconsin Farm Trac. Co., Sauk City, Wis.	Wisconsin, E	16	30	3-4	28	3500	5440		Wh.	52	Clim.	4 Ver.	5 x 6½	800
120	Yuba Mfg. Co., Marysville, Calif.	Ball Thread	12	20	3		3500	6750	2,945	Cr.		Wauk.	4 Ver.	4½ x 6¾	700
121		Ball Thread	20	35	5-6		6000	10100	4,625	Cr.		Wisc.	4 Ver.	5¾ x 7	700
	One- and Two-Horse Tractors														
122	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	General Purpose	6	12	1-16		1000	2500	795	Wh.	48	Le Roi	4 Ver.	3⅛ x 4½	1000
123	Atlantic Mch. Mfg. Co., Cleveland, Ohio.	Merry Garden					250		185						
124	Avery Co., Peoria, Ill.	Avery, 5-10 B	5	10	2	22 x 32	800	2600		Wh.	38	Own	4 Ver.	3 x 4	1200
125		Avery, 6-cyl	7	12		22-32		3150		Wh.	38	Own	6 Ver.	3 x 4	1200
126	Beeman Tractor Co., Minneapolis, Minn.	Beeman, G	2	4	1-7	Non	260	550	310	Wh.	25	Own	1 Ver.	3½ x 4½	850
127	Elderfield Mechanics Co., Pt. Washington, N. Y.	Universal, 20	1	4	1		250	750	450		36	Own	1 Ver.	3½ x 5	1000
128	Indiana Silo Co., Anderson, Ind.	Indiana	5	10	1		900	2000		Wh.	50	Le Roi	4 Ver.	3⅛ x 4½	950
129	La Crosse Trac. Co., La Crosse, Wis.	La Crosse, M	7	12	1-16	18	1000	2600	750	Wh.	48	Own	2 Hor.	4 x 6	1000
130	Market Garden Trac. Co., Minneapolis, Minn.	Market	2	4½	1-7			550			24	Verac	1 Hor.	4 x 4	850
131	New Britain Mch. Co., New Britain, Conn.	New Britain, 1						650		Wh.	26½	Own	2 Ver.	2¾ x 4	
132	New Britain Mch. Co., New Britain, Conn.	New Britain, 2						750		Wh.	32	Own	2 Ver.	2¾ x 4	
133	Midwest Engine Co., Indianapolis, Ind.	Utilitor	2	4	1		150-200	750	345	Wh.	24¾	Own	1 Ver.	3⅛ x 4½	1200
134	Scientific Farming Mchy., Minneapolis, Minn.	Princess Pat	12	25	2	24-26	2000	3500	1,750	Wh.	46	Buda	4 Ver.	4¼ x 5½	1000
135	Toro Motor Co., Minneapolis, Minn.	Toro		12	2		1100	2400	900	Wh.	42	Le Roi	4 Ver.	3⅛ x 4½	1200
	Motor Cultivators														
136	Avery Co., Peoria, Ill.	Avery, C						3450		Wh.	38	Own	4 Ver.	3 x 4	1200
137	Bailor Plow Mfg. Co., Atchison, Kans.	Bailor, A	6					2150	925	Wh.	44	Le Roi	4 Ver.	3⅛ x 4½	1000
138		Bailor, W	6					1800	775	Wh.	40	Le Roi	4 Ver.	3⅛ x 4½	1000
139	Detroit Culto-Tractor Corp., Detroit, Mich.	Detroit Culto, AA	9	16	2	20 x 28	1600	1800	775	Wh.	42	Own	2 Ver.	4 x 6	400
140	Emmerson-Brantingham Co., Rockford, Ill.	E-B			None			3200		Wh.	42	Le Roi	4 Ver.	3⅛ x 4½	100
141	Toro Motor Co., Minneapolis, Minn.	Toro					1100	2700		Wh.	42	Le Roi	4 Ver.	3⅛ x 4½	1200
142	Wilson Trac. Co., Peoria, Ill.	Wilson, J	6	12	2			3000	890		44	Le Roi	4 Ver.	3⅛ x 4½	1000

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carbureter**—Ray, Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Cr., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley; Len., Leonard. **Magneto**—A-K, Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck., Bier., Bierman., Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl., J. C., sliding jaw clutch. **Final drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

and Their Technical Specifications

Tractor specifications appear the last issue of each month

Line No.	Fuel	Make and size of carburetor	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Type of gearset	Make of radiator	Make of bearings in transmission	Make of bearings in front axle	Make of bearings in rear axle	Belt pulley diameter	Belt pulley R. P. M.	Belt Speed F. P. M.	Speeds forward	Speed range M. P. H.	Recommended plowing speed	Final Drive	Drive	Furrow wheel	Line No.
75	K	-Scheb.	Ben.	Bosch	Own	Own	Sl. G.	Own	.....	.....	.....	11½	700	.....	3	2½-3½	3	S. G.	.....	.....	75
76	G-K	1½-Scheb.	.....	K-W	Own	Own	.....	Long	Hyatt	.....	.....	26	320	.....	2	2¼-3¼	2¼	G.	.....	.....	76
77	G-K	1½-Scheb.	.....	K-W	Own	.....	Sel.	Modine	.....	.....	.....	26	350	.....	2	2¼-3	2¼	G.	.....	.....	77
78	G-K	2 -Scheb.	.....	K-W	Own	.....	.....	Modine	.....	.....	.....	32	275	.....	1	.....	2½	G.	.....	.....	78
79	G-K	2½-Scheb.	.....	K-W	Own	.....	.....	Modine	.....	.....	.....	34	275	.....	1	.....	2½	G.	.....	.....	79
80	K	1½-King.	Ben.	.....	Own	Own	.....	Modine	Hyatt	Hyatt	Hyatt	7x11	750	2125	1	2-2¾	2½	.....	.....	Yes	80
81	K	1¼-King.	.....	Dixie	Own	Own	Sl. G.	Perfex	Hyatt	Timk.	Hyatt	18	475	2200	2	1½-2½	2½	G.	In.	.....	81
82	G-K	1½-Strom.	Ben.	Dixie	Bier.	Own	.....	S-J	Hyatt	Own	Own	12	900	2825	2	2½-5	2½	S. G.	In.	Yes	82
83	G-K	1¼-Holl.	Ben.	Bosch	B. & B.	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	16	650	2700	2	2.2-2.9	2.9	S. G.	In.	Yes	83
84	G-K	1½-Holl.	Ben.	K-W	Own	Own	Sl. G.	Modine	Hyatt	Own	Hyatt	17	528	2350	2	2-2.75	2¾	S. G.	In.	.....	84
85	G-K	2 -King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	20	600	3150	2	1.4-2	2	S. G.	Op.	.....	85
86	G-K	2½-King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	200	1	2	2	G.	Op.	.....	86
87	G-K	3 -King.	.....	K-W	Own	Own	Sl. G.	Own	Own	Own	Own	23	535	3200	1	2	2	S.	Op.	.....	87
88	G	1½-Holl.	Ben.	Remy	B. & B	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	9	.....	2600	1	½-3½	3½	G.	In.	Yes	88
89	K	2½-King.	.....	Wico.	Own	Own	Sl. G.	Perfex	Own	Own	Own	9x24	.....	.....	1	2-2.42	2-2.42	S. G.	.....	.....	89
90	K	3 -King.	.....	Wico.	Own	Own	Sl. G.	Perfex	Own	Own	Own	12x30	.....	.....	1	1.86	1.86	S. G.	.....	.....	90
91	K	1¼-King.	Own	Eise.	Own	Own	Sl. G.	Perfex	.....	Hyatt	Hyatt	12	1000	3141	3	1.80-4	.....	I. G.	In.	.....	91
92	K	1½-Strom.	Ben.	Eise.	Own	Nutt.	Sl. G.	Eureka	Hyatt	.....	.....	14	650	2500	2	2½-4	2½	I. G.	.....	Yes	92
93	G-K	1½-King.	Ben.	K-W	Own	Own	.....	S-J	Timk.	Timk.	Timk.	14	750	.....	3	1¾-4	2½	S. G.	.....	.....	93
94	G-K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	S-J	Own	Own	Own	17½	650	.....	3	1¾-4¼	2½	.....	.....	.....	94
95	G-K	1¼-Strom.	Len.	Dixie	Twin	Foote	Sl. G.	Perfex	Hyatt	Hyatt	Hyatt	14	590	2200	2	2-3	.....	I. G.	Op.	.....	95
96	K	1¼-Linga	John.	K-W	Bier.	Own	Sl. G.	S-J	Own	Own	Own	14	800	2500	1	3	3	Ch.	.....	Yes	96
97	G-K	-King.	Ben.	Split.	Own	Own	.....	Perfex	Opt.	Timk.	Timk.	14	2500	.....	2	3-3	3	G.	.....	Yes	97
98	G-K	1⅜-King.	.....	King.	Own	Own	.....	Bremer	S. K. F.	Plain	Plain	14	650-1065	2380-3900	7	1⅞-4	2	S. G.	In.	Yes	98
99																					99
100	G-K	1¼-Ben.	Ben.	Dixie	Bier.	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	14½	2600	703	2½-3½	.....	2½	B. G.	In.	Yes	100
101	G-K	1 -King.	Ben.	Dixie	Own	.....	Fr.	Perfex	U. S.	.....	Own	12	700	2200	7	1-5	1¼	B. G.	Op.	Yes	101
102	G-K	1⅜-King.	Ben.	Dixie	Own	.....	Fr.	Perfex	U. S.	.....	Own	14	600	2200	7	1-4	2¼	B. G.	.....	Yes	102
103	K	1¼-King.	Ben.	Bosch	Own	Cotta	Sl. G.	.....	.....	.....	.....	12½	915	3000	3	1½-3¾	2¼	S. G.	Op.	.....	103
104	K	1¼-King.	Ben.	Dixie	Own	Cotta	Sl. G.	.....	.....	.....	.....	12½	810	2850	3	1½-3¾	2¼	S. G.	Op.	.....	104
105	K	1½-King.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	.....	12½	840	2749	2	2.4-3¾	2.4	S. G.	Op.	.....	105
106	K	2 -King.	Ben.	Bosch	Own	Own	Sl. G.	.....	.....	.....	.....	24	525	3310	2	2-4½	2	S. G.	Op.	.....	106
107	G	1 -King.	Ben.	Dixie	Full.	Full.	Sl. G.	Modine	.....	Timk.	Timk.	10	850	2200	3	1¾-4¾	2½	I. G.	In.	Yes	107
108	G-K	1½-Opt.	Opt.	Dixie	.....	Own	Sel.	Splitex	Own	Own	Own	18	950	.....	2	2-3	2½-3	I. G.	.....	Yes	108
109													700								109
110													490								110
111	G-K	1½-Strom.	Ben.	Dixie	.....	Own	.....	Modine	Hyatt	Hyatt	Hyatt	12	850	2669	1	2½	2½	I. G.	.....	Yes	111
112	K	1⅜-King.	.....	Dixie	Own	Own	Sl. G.	Todd	Hyatt	Hyatt	Own	12	950	2985	1	2½-3	3	S. G.	In.	Yes	112
113	G	1½-Strom.	Ben.	Eise.	B. & B.	Own	Sel.	Bremer	Hyatt	N. D.	N. D.	12	900	2600	3	1¾-4½	2½	I. G.	.....	.....	113
114	G-K	1¼-King.	Ben.	Dixie	Own	Own	.....	Perfex	Hyatt	Own	Own	14	600	600	2-2½	1¾-3	2½	.....	.....	Yes	114
115	K	1½-Ben.	Ben.	Dixie	Twin	Nutt.	Sl. G.	Perfex	Timk.	Timk.	Timk.	11	900	2600	2.6-3.8	2-4	2.6	S. G.	In.	Yes	115
116	G-K	-Ben.	Ben.	Simms	B. & B.	.....	Sl. G.	.....	.....	.....	Gurney	Hyatt	9	1000	2300	2	2½-5	2½	I. G.	.....	Yes	116
117	K	1½-Scheb.	.....	Dixie	Own	Own	Sl. G.	Modine	Hyatt	.....	Hyatt	14	750	2750	2¼-3	2¼-3	2¼-3	S. G.	In.	Yes	117
118	G	1¼-King.	.....	Dixie	Full.	Fuller	Sl. G.	Ideal	.....	.....	.....	Timk.	12	900	.....	3	2-5	3	I. G.	In.	Yes	118
119	K	1½-Strom.	Ben.	Eise.	B. & B.	Foote	Sl. G.	Perfex	Hyatt	.....	.....	16	600	2600	2	1½-4	2½	S. G.	In.	.....	119
120	D	1¼-Ens.	Donald.	Bosch	B. & B.	Own	Sl. G.	Own	Hyatt	.....	Hyatt	12	700	2200	3	1.5-4	2.08	B. P.	.....	.....	120
121	D	-Strom.	Donald.	Bosch	Para.	Own	Sl. G.	Own	Hyatt	.....	Hyatt	10-14	700	1835	2	2.06-3.28	2.06	I. G.	.....	.....	121

One- and Two-Horse Tractors

122	G	⅞-King.	Ben.	.....	B. & B.	Own	Sl. G.	Own	Gurney	Own	Own	10	1000	2600	1	1½-2.4	2.4	.....	.....	Yes	122
123																					123
124	G-K	¾-King.	.....	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1½-4¼	2⅛	S. G.	Op.	.....	124
125	G-K	¾-King.	.....	K-W	Own	Own	Sl. G.	Own	.....	Own	Hyatt	12	780	2450	3	1½-4¼	2⅛	S. G.	Op.	.....	125
126	G	¾-King.	Donald.	Heinze	Own	Own	.....	S-J	.....	None	None	4½	850	900	1	¾-3	2	G.	.....	Yes	126
127	G	⅞-Zen.	.....	A-K	Own	Own	.....	Main	.....	.....	.....	6	1000	.....	1	1-3	2	Worm	.....	.....	127
128	K	⅞-King.	Ben.	A-K	Own	Own	Sl. G.	Cand.	.....	.....	.....	.....	1200	.....	1¼-4	.....	.....	Ch.	Op.	.....	128
129	K	1¼-King.	Ben.	.....	Own	Own	Own	Hopper	.....	Own	Own	10	1000	2600	1	1¾-2½	2½	.....	.....	Yes	129
130	G	1½-Verac	Ben	Berl.	Own	Own	Spec.	.....	.....	Timk.	.....	6	2000	.....	1	1½-2½	2½	Worm	.....	.....	130
131	G	¾-King.	.....	Dixie	.....	.....	.....	.....	.....	.....	.....	.....	1500	.....	.....	1-3	.....	I. G.	.....	.....	131
132	G	¾-King.	.....	Dixie	.....	.....	.....	.....	.....	.....	.....	.....	1500	.....	.....	1-3	.....	I. G.	.....	.....	132
133	G	¾-King.	Own	Eise.	Own	Own	.....	Modine	Fafnir	.....	.....	4½	1200	1200	1	2½	2¼	I. G.	In.	.....	133
134	K	¼-Ben.	Martain	Dixie	B. & B.	Own	Sl. G.	S-J	Hyatt	Hyatt	Hyatt	12	1000	3100	2	2½-4½	2½	I. G.	In.	Yes	134
135	G	⅞-King.	Ben	Eise.	Own	Own	Sl. G.	B. & W.	Opt.	.....	Hyatt	8	1200	2400	2	1-3½	3½	S. G.	In.	.....	135

Motor Cultivators

136	G-K	¾-King.	.....	K-W	Own	Own	Sl. G.	Own	Hyatt	Own	Own	12	780	2450	3	1½-4¼	2⅛	S. G.	Op.	.....	136
137	G	⅞-King.	Ben.	Dixie	B. & B.	.....	.....	Perfex	.....	Hyatt	Hyatt	.....	.....	.....	2	2½-3 7-10	.....	Ch.	.....	.....	137
138	G	⅞-King.	Ben.	Dixie	B. & B.	.....	.....	Perfex	.....	Hyatt	Hyatt	.....	.....	.....	2	2½-3 7-10	.....	Ch.	.....	.....	138
139	G	1¼-Strom.	Own	Bosch	Own	Own	Sl. G.	Own	Hyatt	Own	Own	8	885	1800	2	1-3	2⅛	B. G.	In.	.....	139
140	G	-Holl.	Ben.	Dixie	Own	None	None	Perfex	Hyatt	Own	Hyatt	7⅛	995	.....	1-5	1½-3½	None	.....	.....	.....	140
141	G	⅞-King.	Ben.	E. & D.	Own	Own	Sl. G.	B. & W.	.....	.....	Hyatt	8x6	1200	2400	2	1-3½	.....	B. G.	In.	.....	141
142	G	¾-King.	Own	Eise.	B. & B.	Own	Sel.	Modine	S. K. F.	Hyatt	Hyatt	6	1000	1570	2	1.3-3.5	.....	S. G.	In.	.....	142

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., Vertical; Hor., horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carbureter**—Ray, Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Webster; Zeph., Zephyr; Ens., Ensignn; Strom., Stromberg; Till., Tolloteon; Zen., Zenith; Cr., Carter. **Air-Cleaner**—Donal., Donaldson; Ben., Bennett; Hol., Holley. **Magneto**—A-K, Atwater-Kent; Sum., Sumter; Eise., Eiseman; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear;; Fr. friction; Plan., planetary; Sl., J. C., sliding jaw clutch. **Final drive**—S. G., spur gear; Ch., chain; D. R., double reduction; B. G., bull gear. **Drive**—Op., open; In., inclosed.

From the Four Winds

Glimpses at the World of Motordom

Coming Motor Events

AUTOMOBILE SHOWS

San Francisco	San Francisco Motor Car Dealers' Ass'n	Feb. 21 to 28
Ottawa, Canada	Motor Show	Feb. 21 to 28
Bethlehem, Pa.	Sixth Annual Show	Feb. 23 to 28
Louisville, Ky.	Louisville Automobile Dealers' Ass'n	Feb. 23 to 28
Pittsfield, Mass.	Mass. State Armory	Feb. 23 to 28
Portland, Ore.	Portland Automobile Trade Ass'n	Feb. 23 to 28
Grand Rapids, Mich.	Automobile Show	Feb. 23 to 28
Wichita, Kans.	Automobile Show	Feb. 23 to 28
Columbus, Ohio	Memorial Hall	Feb. 24 to 28
Fort Dodge, Ia.	Automobile Dealers' Ass'n	Feb. 24 to 28
Copenhagen, Denmark	Automobile Show	Feb. 27 to March 7
Newark, N. J.	First Regiment Armory	Feb. 28 to March 6
St. Joseph, Mo.	St. Joseph Automobile Dealers' Ass'n	March 1 to 6
Omaha, Nebr.	Automobile Show	March 1 to 6
Scranton, Pa.	Automobile Show	March 1 to 6
Buffalo, N. Y.	Buffalo Automobile Dealers' Ass'n	March 1 to 6
Portland, Maine	Portland Automobile Dealers' Ass'n	March 1 to 6
Perth Amboy, N. J.	First Automobile Show	March 1 to 6
Lyons	Automobile Show	March 1 to 6
Springfield, Mass.	Springfield Automotive Dealers' Ass'n	March 1 to 7
Tulsa, Okla.	Automobile Show	March 1 to 6
Syracuse, N. Y.	Syracuse Automobile Dealers' Ass'n	March 1 to 6
Seattle, Wash.	Seattle Automobile Show	March 1 to 6
Denver	Denver Automobile Trade Ass'n	March 2 to 6
Clinton, Iowa	Clinton Automobile Dealers' Ass'n	March 3 to 6
Quincy, Ill.	Quincy Automobile Dealers' Ass'n	March
Lancaster, Pa.	Automobile Show	March 3 to 6
Gloversville, N. Y.	Automobile Show	March 8 to 13
Indianapolis, Ind.	Automobile Show	March 8 to 13
Jersey City, N. J.	Automobile Show	March
Boston, Mass.	Mechanics' Bldg.	March 13 to 20
New Orleans	Automobile Show	March
Little Rock, Ark.	Liberty Hall	March 2 to 6
La Salle, Ill.	Illinois Valley Automobile Dealers' Ass'n	March 12 to 14
Great Falls, Mont.	Automobile Show	March 15 to 20
Wilkes-Barre, Pa.	Passenger Car & Truck Show	March 15 to 22
Duluth, Minn.	Automobile Show	March 22 to 27
Oklahoma City, Okla.	Oklahoma City Dealers' Ass'n	March 22 to 27
Torrington, Conn.	Automobile Show	March 22 to 27
Utica, N. Y.	Annual Automobile Show	March 22 to 27
Columbia, S. C.	Automobile Show	March 22 to 27
Goldsboro, N. C.	Goldsboro Automotive Trade Ass'n	March 31 to Apr. 3
Albany, Ala.	Automobile Show	April 6 to 10

MISCELLANEOUS CONVENTIONS AND MEETINGS

Lake Charles, La.	Louisiana-Mississippi Automotive Trade Ass'n Convention	March 17 to 18

RACES

Beverly Hills, Los Angeles	Track Race	March 17
Indianapolis Speedway	500-Mile Race	May 31
Tacoma, Wash.	Speedway Race	July 5

TOURS

New York-San Francisco	Glidden Tour	September
Lake Huron Tour		July

Detroit Air Club Buys Ground—The Detroit Aviation Club has completed negotiations for the purchase of the Walter Flanders estate of 870 acres upon which to establish the Aviation Country Club and flying field. Announcement of the plans followed a meeting of the club Wednesday night when directors, headed by Maj. N. J. Boots, commander at Selfridge Field, were elected.

In addition to the flying field a golf course will be constructed and the remainder of the land will be divided into building lots, 1,800 to be available to members exclusively, for the erection of homes. The home and outbuildings of the Flanders estate will be taken over practically intact. Little remodeling will be necessary to fit them for the use of pilots. Among the buildings is a pavilion, containing a billiard room, a commodious garage and an indoor riding track.

The immense barns, all of modern construction, are located close to the flying field and quickly can be converted into hangars. They are believed to be of sufficient size for housing the largest planes that will be used at the field. The deal involves the expenditure of $750,000 and the first payment will be made to the estate March 1, giving the club occupancy early in April.

Plan Truck Freight Service—Motor truck freight service to points within 100 miles of Toledo, is being worked out by the Hi-Ways Transport Association. Extension of the service on various routes through the co-operation of the commercial club is planned. The longest route at present is a 90-mile run to Flint, Mich., by way of Detroit, over which there is daily service. Other daily routes are: Findlay, Bowling Green, Freemont, Bryan, and points beyond.

Extension of the Findlay line to Canton, a 90-mile run is planned, and a line to Dayton is being considered. In this connection, Cincinnati shippers have offered a guaranteed daily tonnage to Detroit.

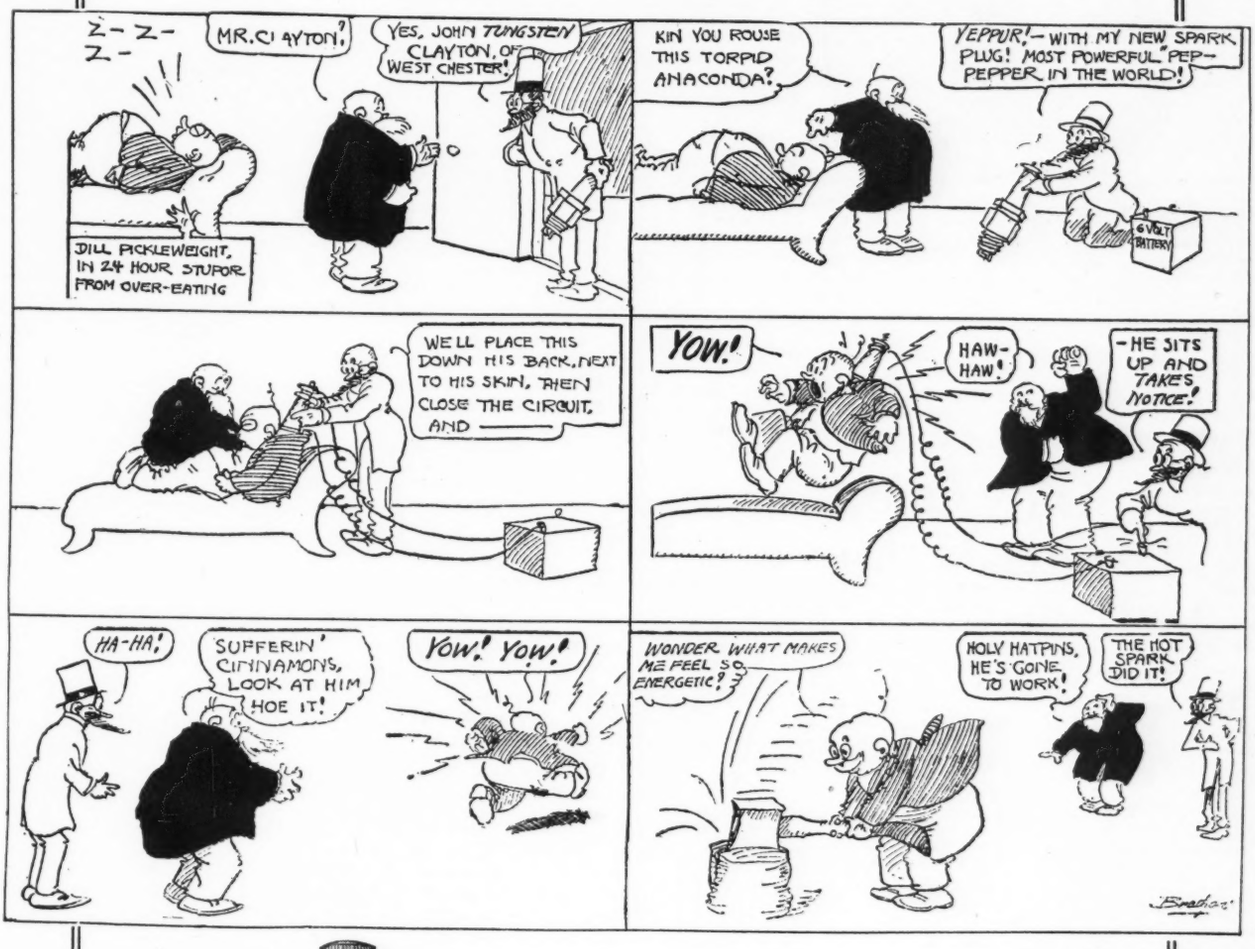
Cincinnati Club to Build—After a two months' search for quarters, in which it has been unsuccessful, the Cincinnati Automobile Club has decided to erect a club-house for its members. Directors of the club contemplate the erection of a seven-story structure in a downtown section, which will contain a dormitory for tourists, club quarters and a garage in which 400 cars can be stored. Present plans are to form a stock company to finance the project. Sketches of the proposed clubhouse have been completed by architects. The proposed site for the structure will be announced as soon as options are secured.

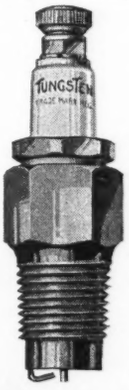
Philadelphia Needs 'Bus Line—A strong movement is underway, because of the constantly congested state of Philadelphia's "elevated subway" and surface lines at rush hours and because the limit of accommodation appears to have been reached especially by the latter, till heavy expense is incurred for extra rolling stock and other equipment, to have a motor 'bus line, on the general plan of the Fifth Ave. 'bus line in New York, established here. "Double-deckers" are favored.

Des Moines Has Many Cars—Des Moines now has ten thousand motor cars and trucks, according to officials of the motor licensing department of the county treasurer's office. In Polk county, of which Des Moines is the county seat, there are 14,000 motor cars and trucks, licenses have been paid on 12,800 cars and trucks and 150 motorcycles. Since the new Iowa licensing law went into effect, Dec. 1, $240,000 has been paid in licenses by the owners in Polk county.

Uncle Peleg's Courtship—Dill Wakes Up

By WALTER BRADFORD.


Z- Z- Z-
MR. CLAYTON?
YES, JOHN TUNGSTEN CLAYTON, OF WEST CHESTER!
DILL PICKLEWEIGHT, IN 24 HOUR STUPOR FROM OVER-EATING
KIN YOU ROUSE THIS TORPID ANACONDA?
YEPPUR!—WITH MY NEW SPARK PLUG! MOST POWERFUL "PEP-PEPPER IN THE WORLD!
6 VOLT BATTERY
WE'LL PLACE THIS DOWN HIS BACK, NEXT TO HIS SKIN, THEN CLOSE THE CIRCUIT, AND
YOW!
HAW-HAW!
—HE SITS UP AND TAKES NOTICE!
HA-HA!
SUFFERIN' CINNAMONS, LOOK AT HIM HOE IT!
YOW! YOW!
WONDER WHAT MAKES ME FEEL SO ENERGETIC?
HOLY HATPINS, HE'S GONE TO WORK!
THE HOT SPARK DID IT!



Courtesy of Philadelphia North American

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